# Solicitation 12616-423

# DC Alexander Park Improvement Project

## Bid Designation: Public

CITY OF FORT LAUDERDALE

## City of Fort Lauderdale

# Bid 12616-423
# DC Alexander Park Improvement Project

| | |
|---|---|
| Bid Number | **12616-423** |
| Bid Title | **DC Alexander Park Improvement Project** |
| Bid Start Date | **Jan 4, 2022 12:42:00 PM EST** |
| Bid End Date | **Feb 28, 2022 12:00:00 PM EST** |
| Question & Answer End Date | **Feb 11, 2022 5:00:00 PM EST** |
| Bid Contact | **Mary K Kleinpeter-Zamora**<br>**Procurement Administrator**<br>**Finance**<br>**954-828-5189**<br>**mkleinpeter-zamora@fortlauderdale.gov** |
| Contract Duration | **One Time Purchase** |
| Contract Renewal | **Not Applicable** |
| Prices Good for | **120 days** |
| Pre-Bid Conference | **Jan 19, 2022 10:00:00 AM EST**<br>**Attendance is optional**<br>**Location: Courtyard by Marriott**<br>**440 Seabreeze Blvd, 33316**<br>**Fort Lauderdale, Florida** |

Bid Comments

**This project is located at 501 South Fort Lauderdale Beach Boulevard, in the City of Fort Lauderdale. The purpose of the project is to revitalize and create a 1.2 acre oceanfront park both vibrant and uniquely branded for local residents, tourists, and citizens of Fort Lauderdale. Key improvements include: signature playground installation, elevated viewing platform overlooking the ocean, elevated ramp/walkway with play elements incorporated into the grade changes, terraced walls with landscape beautification, decorative metal canopy/trellis, and public restroom. The work to be accomplished under this contract includes, but is not limited to, site clearing and demolition, tree relocations, landscaping, pedestrian lighting and site furnishings, pavers, decorative concrete, structural concrete and masonry, deep foundations, waterproofing, epoxy flooring, plumbing, bathroom fixtures, HVAC, site electrical, architectural/decorative metal, playground installation, mass site grading, site civil utilities, streetscape improvements along NE 5$^{th}$ Street, and sidewalk and landscape improvements along North Bound and South Bound SR A1A.**

**Note all alternates are deducts from base bid.**
**Added on Jan 6, 2022:**
**Addendum # 2 Issued -01/06/2022 Changes date and location of Pre-bid.**
**Added on Feb 7, 2022:**
**Addendum # 3 issued 02/07/2022 changes bid closing date to 2/18/2022**
**Added on Feb 8, 2022:**
**Addendum 4 issued 2/8/2022 changes the question and answer period to extend to February 11, 2022.**
**Added on Feb 23, 2022:**
**Addendum 9 changes bid close date and time to February 28,2022 at 12:00 pm**

**Added on Feb 23, 2022:**
**Addendum 10 is issued to correct error on addendum 9**

**Addendum # 1**

**Conference on Jan 19, 2022 10:00:00 AM EST as been added**

**Conference on Jan 12, 2022 10:00:00 AM EST has been removed**

**Addendum # 2**

New Documents **Addendum 1.doc**

**Addendum # 3**

New Documents **Addendum 3.doc**

Previous End Date **Feb 11, 2022 2:00:00 PM EST** New End Date **Feb 18, 2022 2:00:00 PM EST**

**Addendum # 4**

New Documents **Addendum 4.doc**

Previous Q & A End Date **Feb 4, 2022 5:00:00 PM EST** New Q & A End Date **Feb 11, 2022 5:00:00 PM EST**

**Addendum # 5**

New Documents **Addendum 5.pdf**

Previous End Date **Feb 18, 2022 2:00:00 PM EST** New End Date **Feb 25, 2022 2:00:00 PM EST**

**Addendum # 6**

New Documents **220209_ASK 03_Door Hardware_Flattened.pdf**
**220204_ASK 02_Restroom Finishes_Flattened.pdf**

**Addendum # 7**

New Documents **12373-LD-101 - TREE DISPOSITION.pdf**
**12373-011-STRM.pdf**

**Addendum # 8**

New Documents **Disadvantaged Business Enterprise DBE Preference Certification 8/4/2021**
**12373-011-STRM.pdf**
**10 71 19.16 - REMOVABLE FLOOD BARRIERS Q63.pdf**
**12373-LP-101 - TREE PALM PLANTING.pdf**
**10 71 19.16 - REMOVABLE FLOOD BARRIERS.pdf**
**220111_ASK 01_Fire Extinguisher Location_Flattened.pdf**
**Addendum 8.pdf**

**Addendum # 9**

| | | | |
|---|---|---|---|
| New Documents | **Addendum 9.pdf** | | |
| Previous End Date | **Feb 25, 2022 2:00:00 PM EST** | New End Date | **Feb 28, 2022 12:00:00 PM EST** |

**Addendum # 10**

| | |
|---|---|
| New Documents | **Addendum 10.pdf** |

**Item Response Form**

| | |
|---|---|
| Item | **12616-423--01-01 - BASE BID: Division 1** |
| Lot Description | **BASE BID** |
| Quantity | **1 lump sum** |
| Unit Price | |
| Delivery Location | **City of Fort Lauderdale**<br>See ITB Specifications<br>See ITB Specifications<br>Fort Lauderdale FL 33301<br>**Qty** 1 |

**Description**
General Requirements, Insurance, Bonds, Professional Services

| | |
|---|---|
| Item | **12616-423--01-02 - BASE BID: Division 2** |
| Lot Description | **BASE BID** |
| Quantity | **1 lump sum** |
| Unit Price | |
| Delivery Location | **City of Fort Lauderdale**<br>See ITB Specifications<br>See ITB Specifications<br>Fort Lauderdale FL 33301<br>**Qty** 1 |

**Description**
Site Demolition and Clearing

| | |
|---|---|
| Item | **12616-423--01-03 - BASE BID: Division 3** |
| Lot Description | **BASE BID** |
| Quantity | **1 lump sum** |
| Unit Price | |
| Delivery Location | **City of Fort Lauderdale**<br>See ITB Specifications<br>See ITB Specifications<br>Fort Lauderdale FL 33301<br>**Qty** 1 |

**Description**
Structural Concrete

| | |
|---|---|
| Item | **12616-423--01-04 - BASE BID: Division 5** |
| Lot Description | **BASE BID** |
| Quantity | **1 lump sum** |
| Unit Price | |
| Delivery Location | **City of Fort Lauderdale**<br>See ITB Specifications<br>See ITB Specifications<br>Fort Lauderdale FL 33301<br>**Qty** 1 |

**Description**
Metals

| | |
|---|---|
| Item | **12616-423--01-05 - BASE BID: Division 5** |
| Lot Description | **BASE BID** |
| Quantity | **1 lump sum** |
| Unit Price | |
| Delivery Location | **City of Fort Lauderdale**<br>See ITB Specifications<br>See ITB Specifications<br>Fort Lauderdale FL 33301<br>**Qty** 1 |

**Description**
Architectural Metal Canopy and Fins

| | |
|---|---|
| Item | **12616-423--01-06 - BASE BID: Division 7** |
| Lot Description | **BASE BID** |
| Quantity | **1 lump sum** |
| Unit Price | |
| Delivery Location | **City of Fort Lauderdale**<br>See ITB Specifications<br>See ITB Specifications<br>Fort Lauderdale FL 33301<br>**Qty** 1 |

**Description**
Thermal and Moisture Protection

| | |
|---|---|
| Item | **12616-423--01-07 - BASE BID: Division 8** |
| Lot Description | **BASE BID** |
| Quantity | **1 lump sum** |
| Unit Price | |
| Delivery Location | **City of Fort Lauderdale**<br>See ITB Specifications<br>See ITB Specifications |

Fort Lauderdale FL 33301
**Qty** 1

**Description**
Doors and Windows

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Item **12616-423--01-08 - BASE BID: Division 9**
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**
Finishes

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Item **12616-423--01-09 - BASE BID: Division 10**
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**
Specialties

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Item **12616-423--01-10 - BASE BID: Division 11**
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**
Playground Equipment

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Item **12616-423--01-11 - BASE BID: Division 12**
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**
Site Furnishings

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| | |
|---|---|
| Item | **12616-423--01-12 - BASE BID: Division 22** |
| 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**
Plumbing

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| | |
|---|---|
| Item | **12616-423--01-13 - BASE BID: Division 22** |
| 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**
Civil Utilities

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| | |
|---|---|
| Item | **12616-423--01-14 - BASE BID: Division 23** |
| 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**
Heating, Ventilation and Air Conditioning

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| | |
|---|---|
| Item | **12616-423--01-15 - BASE BID: Division 26** |
| 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**
Electrical

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Item **12616-423--01-16 - BASE BID: Division 27**

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**
IT/Low Voltage System

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Item **12616-423--01-17 - BASE BID: Division 31**

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**
Earthwork

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Item **12616-423--01-18 - BASE BID: Division 31**

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**
Augercast Piles

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| | |
|---|---|
| Item | **12616-423--01-19 - BASE BID: Division 32** |
| Lot Description | **BASE BID** |
| Quantity | **1 lump sum** |
| Unit Price | |
| Delivery Location | **City of Fort Lauderdale**<br>See ITB Specifications<br>See ITB Specifications<br>Fort Lauderdale FL 33301<br>**Qty** 1 |

**Description**
Landscaping and Irrigation

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| | |
|---|---|
| Item | **12616-423--01-20 - BASE BID: Division 32** |
| Lot Description | **BASE BID** |
| Quantity | **1 lump sum** |
| Unit Price | |
| Delivery Location | **City of Fort Lauderdale**<br>See ITB Specifications<br>See ITB Specifications<br>Fort Lauderdale FL 33301<br>**Qty** 1 |

**Description**
Flatwork (pavers)

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| | |
|---|---|
| Item | **12616-423--01-21 - BASE BID: Division 32** |
| Lot Description | **BASE BID** |
| Quantity | **1 lump sum** |
| Unit Price | |
| Delivery Location | **City of Fort Lauderdale**<br>See ITB Specifications<br>See ITB Specifications<br>Fort Lauderdale FL 33301<br>**Qty** 1 |

**Description**
Flatwork (concrete)

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| | |
|---|---|
| Item | **12616-423--01-22 - BASE BID: Division 32** |
| Lot Description | **BASE BID** |
| Quantity | **1 lump sum** |
| Unit Price | |
| Delivery Location | **City of Fort Lauderdale**<br>See ITB Specifications<br>See ITB Specifications<br>Fort Lauderdale FL 33301<br>**Qty** 1 |

**Description**
Poured-in-Place Rubber Surface

| | |
|---|---|
| Item | **12616-423--01-23 - BASE BID: Division 32** |
| Lot Description | **BASE BID** |
| Quantity | **1 lump sum** |
| Unit Price | |
| Delivery Location | **City of Fort Lauderdale**<br>See ITB Specifications<br>See ITB Specifications<br>Fort Lauderdale FL 33301<br>**Qty** 1 |

**Description**
Synthetic Turf

| | |
|---|---|
| Item | **12616-423--01-24 - BASE BID: Division 32** |
| Lot Description | **BASE BID** |
| Quantity | **1 lump sum** |
| Unit Price | |
| Delivery Location | **City of Fort Lauderdale**<br>See ITB Specifications<br>See ITB Specifications<br>Fort Lauderdale FL 33301<br>**Qty** 1 |

**Description**
Asphalt Curbing

| | |
|---|---|
| Item | **12616-423--02-01 - ALTERNATE BID: 1A** |
| Lot Description | **ALTERNATE BID** |
| Quantity | **1 lump sum** |
| Unit Price | |
| Delivery Location | **City of Fort Lauderdale**<br>See ITB Specifications<br>See ITB Specifications<br>Fort Lauderdale FL 33301<br>**Qty** 1 |

**Description**
In Lieu of Decorative Concrete finish type C1-C3 replace with type C4 standard grey concrete with broom finish

| | |
|---|---|
| Item | **12616-423--02-02 - ALTERNATE BID: 2A** |
| Lot Description | **ALTERNATE BID** |
| Quantity | **1 lump sum** |
| Unit Price | |
| Delivery Location | **City of Fort Lauderdale**<br>See ITB Specifications<br>See ITB Specifications |

Fort Lauderdale FL 33301
**Qty** 1

**Description**
In Lieu of Pavers in Right-of-Way replace with type C4 standard grey concrete with broom finish and diamond sawcut pattern to match existing sawcut pattern along State Road A1A

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| | |
|---|---|
| Item | **12616-423--02-03 - ALTERNATE BID: 3A** |
| Lot Description | **ALTERNATE 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**
Eliminate white circuit for light fixtures. All lights to be amber only. This will eliminate the L1 white tape light and eliminate the clock to switch from amber to white.

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| | |
|---|---|
| Item | **12616-423--02-04 - ALTERNATE BID: 4A** |
| Lot Description | **ALTERNATE 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**
Eliminate security cameras, cabling, and telecom room buildout. Only provide and install conduit w/pullstring, pull boxes, fire-rated plywood, and rough-ins.

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| | |
|---|---|
| Item | **12616-423--02-05 - ALTERNATE BID: 5A** |
| Lot Description | **ALTERNATE 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**
In Lieu of epoxy flooring provide non-slip sealer in the bathrooms and IT Room. Eliminate expoxy on ceiling finish C2 - ceiling finish to match wall finish.

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| | |
|---|---|
| Item | **12616-423--02-06 - ALTERNATE BID: 6A** |
| Lot Description | **ALTERNATE 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**
Reduce architectural canopy size by 30%

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| | |
|---|---|
| Item | **12616-423--02-07 - ALTERNATE BID: 6B** |
| Lot Description | **ALTERNATE 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**
Eliminate architectural canopy

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| | |
|---|---|
| Item | **12616-423--02-08 - ALTERNATE BID: 7A** |
| Lot Description | **ALTERNATE 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**
Reduce poured in place rubber surfacing to two (2) colors and colors to be 70/30 blend with black

# *CITY OF FORT LAUDERDALE*
# *CONTRACT AND SPECIFICATIONS PACKAGE*

## BID NO. 12616-423

## PROJECT NO. P12373

# DC ALEXANDER PARK IMPROVEMENT

**Tom Green**
**Project Manager**

**Mary Kleinpeter-Zamora**
**Procurement Administrator**
**Telephone: (954) 828-5189**
**E-mail: mkleinpeter-zamora@fortlauderdale.gov**

# TABLE OF CONTENTS

**Description**



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

CITB Questionnaire Sheet
CITB Trench Safety
Local Business Preference Certification
Non-Collusion Statement
Non-Discrimination Certification Form
Construction Bid Certification Page

## INVITATION TO BID

Sealed bids will be received electronically until **2:00 p.m.**, local time, on February 11, **2022,** and opened online immediately thereafter for **BID NO., 12616-423, PROJECT NO., 12373, DC Alexander Park Improvement Project.**

All openings will be held on the BIDSYNC.COM platform. Once the Procurement Specialist opens the solicitation, the bid tabulations may be viewed immediately on a computer, laptop, cell phone, or any other device with WiFi access. The opening may also be viewed in real time through a "Microsoft Teams"

Microsoft Teams meeting

**Join on your computer or mobile app**

Click here to join the meeting

**Or call in (audio only)**

+1 954-686-7296,,27098620# United States, Fort Lauderdale

Phone Conference ID: 270 986 20#

Find a local number | Reset PIN

Anyone requesting assistance or having further inquiry in this matter must contact the Procurement Specialist indicated on the solicitation, via the Question and Answer (Q&A) platform on Bidsync.com before the Last Day for Questions indicated in the Solicitation.

This Project is located at 501 South Fort Lauderdale Beach Boulevard, in the City of Fort Lauderdale

**Drawing Plans:** The drawings for the project can be obtained from Bidsync free of charge.

**Licensing Requirements:** Possession of a State of Florida Certified General Contractor's License is required for this Project.

The purpose of the project is to revitalize and create a 1.2 acre oceanfront park both vibrant and uniquely branded for local residents, tourists, and citizens of Fort Lauderdale. Key improvements include: signature playground installation, elevated viewing platform overlooking the ocean, elevated ramp/walkway with play elements incorporated into the grade changes, terraced walls with landscape beautification, decorative metal canopy/trellis, and public restroom. The work to be accomplished under this contract includes, but is not limited to, site clearing and demolition, tree relocations, landscaping, pedestrian lighting and site furnishings, pavers, decorative concrete, structural concrete and masonry, deep foundations, waterproofing, epoxy flooring, plumbing, bathroom fixtures, HVAC, site electrical, architectural/decorative metal, playground installation, mass site grading, site civil utilities, streetscape improvements along NE 5th Street, and sidewalk and landscape improvements along North Bound and South Bound SR A1A.

**Drawing Plans:** This Project consists of Drawing File No., 4-143-19, 155 sheets. Drawing plans may be obtained **free of charge** at BIDSYNC.COM.

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

**Pre-Bid Meeting/Site visit:** A pre-bid meeting and site visit will be held on Wednesday, January 19, 2022 at 10:00 am local time, at 100 North Andrews, Fort Lauderdale, Florida (City Hall) 4th floor conference room followed by a site visit to the project site.

While attendance is not mandatory, it is strongly suggested that all contractors attend the pre-proposal conference. 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.

**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 offer.

**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.

2) Bidders may **upload** their original executed bid bond on BIDSYNC to accompany their electronic bids and deliver the original, signed and sealed hard copy within **five (5)** business days after bid opening, with the company name, bid number and title clearly indicated.

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, Florida 33301-1016, before time of bid opening, with the company name, bid number and title clearly indicated on the envelope.

4) Bidders can **mail** their bid bond to the Finance Department, Procurement Services Division, 100 North Andrews Avenue, Room 619, Fort Lauderdale, Florida 33301-1016, before time of bid opening, with the company name, bid number and title clearly indicated on the envelope. NOTE: Bond must be received in Procurement and time stamped before bid opening.

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**

**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, Florida 33301-1016, with the bid number and title clearly indicated on the envelope.

It is the bidder's sole responsibility to ensure that his bid bond or other bid security is received by the Procurement Services Division before time of bid opening. Failure to adhere to this requirement may be grounds to consider the bid as non-responsive.

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 Q&A platform 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). **Bidders 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 bidder 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 – https://www.fortlauderdale.gov/government/departments-a-h/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.

CONCERNING SUB-CONTRACTORS, SUPPLIERS, AND OTHERS - The amount of work that is sublet by the Bidder shall be limited by the condition that the Bidder shall, with his own organization, perform at least forty percent (40%) of the total dollar amount of the Work to be performed under the Agreement.

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 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 addenda 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.

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 –
During the term of this Agreement, Contractor at its sole expense, shall provide insurance of such a type and with such terms and limits as noted below. Providing and maintaining adequate insurance coverage is a material obligation of Contractor. Contractor shall provide the City a certificate of insurance evidencing such coverage. Contractor's insurance coverage shall be primary insurance as respects to the City for all applicable policies. The limits of coverage under each policy maintained by Contractor shall not be interpreted as limiting Contractor's liability and obligations under this Agreement. All insurance policies shall be through insurers authorized or eligible to write policies in Florida and possess an A.M. Best rating of A-, VII or better, subject to the approval of the City's Risk Manager.

The coverages, limits and/or endorsements required herein protect the primary interests of the City, and these coverages, limits and/or endorsements shall in no way be required to be relied upon when assessing the extent or determining appropriate types and limits of coverage to protect the Contractor against any loss exposures, whether as a result of this Agreement or otherwise. The requirements contained herein, as well as the City's review or acknowledgement, is 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/coverages are required:

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

Policy must include coverage for Contractual Liability, Independent Contractors, and contain no exclusions for explosion, collapse, or underground.

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

The City, a political subdivision of the State of Florida, its officials, employees, and volunteers are to be covered as an additional insured 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, its officials, employees, or volunteers.

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.

Crane and Rigging Liability (if applicable)

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.

Workers' Compensation and Employer's Liability

Coverage must be afforded per Chapter 440, Florida Statutes. Any firm performing work 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 and its insurance carrier waive all subrogation rights against the City, a political subdivision of the State of Florida, its officials, employees, and volunteers for all losses or damages. The City requires the policy to be endorsed with WC00 03 13 Waiver of our Right to Recover from Others or equivalent.

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

For any Contractor who has exempt status as an individual, the City requires proof of Workers' Compensation insurance coverage for that Contractor's employees, leased employees, volunteers, and any workers performing work in execution of this Agreement.

If the Contractor has applied for a workers' compensation exemption, the City does not recognize this exemption to extend to the employees of the Contractor. The Contractor is required to provide proof of coverage for their employees, leased employees, volunteers and any workers performing work in execution of this Agreement. This applies to all contractors including but not limited to the construction industry.

Pollution and Remediation Legal Liability (If any Hazardous Materials)

For the purpose of this section, the term "hazardous materials" includes all materials and substances that are designated or defined as hazardous by Florida or Federal law or by the rules or regulations of Florida or any Federal Agency. If work being performed involves hazardous materials, the Contractor shall procure and maintain any or all of the following coverage, which will be specifically addressed upon review of exposure.

Contractors Pollution Liability Coverage

For sudden and gradual occurrences and in an amount not less than $1,000,000 per claim arising out of this Agreement, including but not limited to, all hazardous materials identified under the Agreement.

Asbestos Liability Coverage

For sudden and gradual occurrences and in an amount not less than $1,000,000 per claim arising out of work performed under this Agreement.

Disposal Coverage

The Contractor shall designate the disposal site and furnish a Certificate of Insurance from the disposal facility for Environmental Impairment Liability Insurance, covering liability for sudden and accidental occurrences in an amount not less than $1,000,000 per claim and shall include liability for non-sudden occurrences in an amount not less than $1,000,000 per claim.

Hazardous Waste Transportation Coverage
The Contractor shall designate the hauler and furnish a Certificate of Insurance from the hauler for Automobile Liability insurance with Endorsement MCS90 for liability arising out of the transportation of hazardous materials in an amount not less than $1,000,000 per claim limit and provide a valid EPA identification number.

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 a Certificate of Insurance to the City with 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 shall indicate if coverage is provided under a claims-made or occurrence form. If any coverage is provided on a claims-made form, the certificate will show a retroactive date, which should be the same 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 Agreement, Bid/Contract number, event dates, or other identifying reference must be listed on the certificate.

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 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 an Umbrella/Excess insurance policy to comply with this requirement.

The Contractor's insurance coverage shall be primary insurance as respects to the City, a political subdivision of the State of Florida, its officials, employees, and volunteers. Any insurance or self-insurance maintained by the City, its officials, employees, or volunteers shall be excess of Contractor's insurance and shall be non-contributory.

Any exclusions or provisions in the insurance maintained by the Contractor that excludes coverage for work contemplated in this Agreement shall be deemed 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, and/or this Agreement is terminated. Any lapse in coverage shall be considered breach of contract. In addition, Contractor must provide 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.

All notices of any claim/accident (occurrences) associated with this Agreement, shall be provided to the Contractor's insurance company and the City's Risk Management office as soon as practical.

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

Bond Requirements
This Agreement is required to be bonded pursuant to Section 255.05, Florida Statutes, and the Contractor shall furnish Payment and Performance bonds on the City's standard form covering the full and faithful performance of the Agreement for construction and the payment of obligations arising hereunder.

All bonds must be underwritten by a surety company authorized to issue bonds in the State of Florida. The Contractor shall deliver required bonds to the City no later than thirty (30) days prior to the start of work contemplated in this Agreement.

If the Surety on any bond furnished by the Contractor is declared bankrupt, becomes insolvent, its right to do business is terminated in the State of Florida, or it ceases to meet the requirements of Section 255.05, Florida Statutes, the Contractor shall within five (5) days thereafter substitute Surety, both of which shall be acceptable to the City.

Loss Control/Safety
Precaution shall be exercised at all times by the Contractor for the protection of all persons, including employees, and property. The Contractor shall comply with all laws, regulations, or ordinances relating to safety and health, and shall make special effort to detect hazardous conditions and shall take prompt action where loss control/safety measures should reasonably be expected.

The City may order work to be stopped if conditions exist that present immediate danger to persons or property. The Contractor acknowledges that such stoppage will not shift responsibility for any loss or damages from the Contractor to the City.

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 made payable to the City of Fort Lauderdale, or bid bond, shall accompany each bid as evidence of the good faith and responsibility of the bidder. The check or bond shall be retained by the City as liquidated damages in the event the bidder whose bid is accepted refuses to or fails to enter into a contract for the execution of the work

solicited in this Invitation to Bid. Retention of such amount shall not be construed as a penalty or forfeiture.

The above bid bond or check shall be a guarantee that the bidder will, if necessary, promptly execute a satisfactory contract and furnish good and sufficient bonds. If the successful bidder fails to enter into, execute, and deliver such a contract and furnish the required bonds within ten (10) days after receiving notice to provide the executed contract, the 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. 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.

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.

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 – Deputy Director of Finance, 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: https://www.fortlauderdale.gov/government/departments-a-h/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_S2-182DIREPRAWINAW

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.

DRAWING PLANS - Drawing plans may be obtained **free of charge** at BIDSYNC.COM.

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 (2021), 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 (2021), 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 hold 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.

LOCAL BUSINESS PREFERENCE **-** Section 2-186, Code of Ordinances of the City of Fort Lauderdale, provides for a local business preference. In order to be considered for a local business preference, a proposer must include the Local Business Preference Certification Statement of this ITB, as applicable to the local business preference class claimed at the time of Proposal submittal:

Upon formal request of the City, based on the application of a Local Business Preference, the Proposer shall, within ten (10) calendar days, submit the following documentation to the Local Business Preference Class claimed:

a. Copy of City of Fort Lauderdale current year business tax receipt, or Broward County current year business tax receipt, and

b. List of the names of all employees of the proposer and evidence of employees' residence within the geographic bounds of the City of Fort Lauderdale or Broward County, as the case may be, such as current Florida driver license, residential utility bill (water, electric, telephone, cable television), or other type of similar documentation acceptable to the City.

Failure to comply at time of proposal submittal shall result in the Proposer being found ineligible for the local business preference.

Definitions:

a. The term "Class A business" shall mean any business that has established and agrees to maintain a permanent place of business located in a non-residential zone, staffed with full-time employees within the limits of the city, and shall maintain a staffing level for the proposed work of at least fifty percent (50%) who are residents of the City of Fort Lauderdale.

b. The term "Class B business" shall mean any business that has established and agrees to maintain a permanent place of business located in a non-residential zone, staffed with full-time employees within the limits of the city, or shall maintain a staffing level for the proposed work of at least fifty percent (50%) who are residents of the City of Fort Lauderdale.

c. The term "Class C business" shall mean any business that has established and agrees to maintain a permanent place of business located in a non-residential zone, staffed with full-time employees within the limits of Broward County.

c. The term "Class D business" shall mean any business that does not qualify as a Class A, Class B, or Class C business.

The complete local business preference 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_S2-186LOBUPR

DISADVANTAGED BUSINESS ENTERPRISE PREFERENCE - Section 2-185, Code of Ordinances of the City of Fort Lauderdale, provides for a disadvantaged business preference. In order to be considered for a disadvantaged business preference, a proposer must include a certification from a government agency, as applicable to the disadvantaged business preference class claimed at the time of Proposal submittal:

Upon formal request of the City, based on the application of a Disadvantaged Business Preference the Proposer shall within ten (10) calendar days submit the following documentation to the Disadvantaged Business Enterprise Preference Class claimed:

a. Copy of City of Fort Lauderdale current year business tax receipt, or the Tri-County (Broward, Dade, West Palm Beach) current year business tax receipt, or proof of active Sunbiz status and

b. List of the names of all employees of the proposer and evidence of employees' residence within the geographic bounds of the City of Fort Lauderdale or the Tri-County, as the case may be, such as current Florida driver license, residential utility bill (water, electric, telephone, cable television), or other type of similar documentation acceptable to the City.

Failure to comply at time of proposal submittal shall result in the Proposer being found ineligible for the Disadvantaged Business Enterprise Preference business preference.

The complete Disadvantaged Business Preference ordinance may be found on the City's website at the following link: https://www.fortlauderdale.gov/home/showpublisheddocument?id=56883

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-11-42 & Resolution No. 07-101, Lobbying Activities. Copies of Ordinance No., C-11-42, 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 33301. The Ordinance may also be viewed on the City's website at https://www.fortlauderdale.gov/home/showdocument?id=6036.

# GENERAL CONDITIONS

**Unless otherwise modified in the Project's 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.

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

"Contractor" – shall mean the successful Bidder who has been employed by the City to perform the construction and related 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. In the case of any inconsistency in or between any parts of this Contract, the Project Manager 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 include the terms "professional engineer" and "licensed engineer" and means a person who is licensed to engage in the practice of engineering under Florida Statute, Chapter 471. An Engineer may be a City employee or a consultant hired by the City.

"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 a professional designated by the City to manage the Project under the supervision and direction of the Public Works Director or designee.

"Public Works Director" – shall mean the Public Works Director of the City of Fort Lauderdale.

"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 Project Manager.

"Sub-contractor" - 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, field conditions, 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.

Any failure by the Contractor to acquaint itself with all the Site conditions shall not relieve Contractor from responsibility for properly estimating the difficulty or cost thereof under the Contract Documents.

**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 Contractor 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. The following requirements shall be met in order for the substitution to be considered:

1. Requests for substitution shall be accompanied by such technical data, as the party making the request desires to submit. The Project Manager will consider reports from

reputable independent testing laboratories, verified experience records from previous users and other written information valid in the circumstances; and

2. 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

3. 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

4. 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.

If a proposed substitution is approved by the Project Manager, 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 – CONSTRUCTION RESOURCES** – Contractor shall provide all labor and equipment necessary to complete the installation within a timely manner. Contractor shall provide details as to manpower and equipment to be dedicated to the project in its Work Plan. Contractor is responsible for making arrangements, obtaining and purchasing construction water services if required to complete the work.

**GC - 05 - CONTROL OF THE WORK** - The Project Manager shall have full control and direction of the Work in all respects. The Project Manager 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 Project Manager may desire respecting the quality of the Work and materials and the manner of conducting the Work. Should the Contractor be 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 Project Manager 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 Project Manager, 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 Project Manager, as will ensure 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.

**GC - 06 - SUB-CONTRACTOR** - The Contractor shall not sublet, in whole or any part of the Work without the written consent and approval of the Project Manager. Within ten (10) days after official notification of starting date, the Contractor must submit in writing, to the Project Manager, a list of all Sub-contractors. No Work shall be done by any sub-contractor until such Sub-contractor has been officially approved by the Project Manager. A sub-contractor not appearing on the original list will not be approved without written request submitted to the Project Manager and approved by the Public Works Director. In all cases, the Contractor shall give his personal attention to the Work of the Sub-contractors and the Sub-contractor is liable to be discharged by the Contractor, at the direction of the Project Manager, for neglect of duty, incompetence or misconduct.

Acceptance of any sub-contractor, other person, or organization by the Project Manager shall not constitute a waiver of any right of Project Manager to reject defective Work or Work not in conformance with the Contract Documents.

Contractor shall be fully responsible for all acts and omissions of its Sub-contractors 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 sub-contractor 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 sub-contractor or other person, or organization, except as may otherwise be required by law.

**GC - 07 - QUANTITIES** - Contractor recognizes and agrees that the quantities shown on plans and Bid/Price Schedule are estimates only and may vary during actual construction. No change shall 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 Project Manager 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 Public Works Director 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 - 08 - 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 - 09 - PERMITS AND PROTECTION OF PUBLIC** – Permits on file with the City and/or those permits to be obtained by the Contractor, 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.

Contractor shall secure all permits and licenses required for completing the Project. Contractor will obtain the necessary State, County, and City construction/work permits if required.

The Contractor shall comply with all applicable Codes, Standards, Specifications, etc. related to all aspects of the Project.

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 to all affected parties prior to proceeding with the Work.

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.

**GC - 10 - DISEASE REGULATIONS** - The Contractor shall enforce all sanitary regulations and take all precautions against infectious diseases as the Project Manager 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 - 11 - CONTRACTOR TO CHECK PLANS, SPECIFICATIONS, AND DATA** - The Contractor shall verify all dimensions, quantities, and details shown on the plans, supplementary drawings, schedules, and shall notify the Project Manager 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 therefrom nor from rectifying such condition at its own expense.

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

**GC - 13 - SAFEGUARDING MARKS** - The Contractor shall safeguard all points, stakes, grade marks, monuments, and benchmarks 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 Professional surveyor registered in the State of Florida if disturbed or destroyed during the course of construction.

**GC - 14 - RESTROOM FACILITIES** - Contractor shall provide portable toilet facilities for employee's use at a location within the Work site to be determined by the City.

**GC - 15 - PROGRESS MEETINGS** - Weekly Status meetings will be conducted with representatives from the City and the Contractor. Contractor shall budget time to participate in such meetings. A well-run Project should result in short meetings.

**GC - 16 - ISSUE RESOLUTION** - Should Contractor become engaged in a dispute with a resident or a City employee, the Contractor shall report the situation to the Project Manager immediately. It shall be mandatory that the City participate in any dispute resolution. Failure of Contractor personnel to notify the City shall obligate Contractor to replace the offending employee immediately if requested by the City.

**GC - 17 - CITY SECURITY-CONTRACTOR AND SUBCONTRACTOR EMPLOYEE INFORMATION** - Prior to commencing work, Contractor shall provide to the City a list of all personnel and sub-contractors on site. The list will include the name, address, birth date and driver's license number for all personnel. All personnel and subcontractors on site will have on their person a company

photo ID during all stages of the construction. Contractor shall provide standard required personal information per current City procedures.

**GC - 18 - POST-CONSTRUCTION SURVEY** - The Contractor shall provide as-built survey, sealed and signed by a registered surveyor in the State of Florida, as a condition of final payment.

**GC – 19 - KEY PERSONNEL** - Contractor shall provide as part of the Work Plan, resumes for all key project personnel providing supervision and project management functions. Resumes shall include work history and years of experience performing this type of work.

**GC - 20 - EXISTING UTILITY SERVICE** - All existing utility service shall be maintained with a minimum of interruption at the expense of the Contractor.

**GC - 21 - 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 - 22 - 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 bodily injury and property damage insurance in amounts satisfactory to the Florida East Coast Company. This insurance requirement shall be verified by the contractor with the Florida East Coast Company prior to commencing work, and maintained during the life of the Contract.

**GC - 23 - 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 Project Manager 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 - 24 - 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 - 25 - 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 the cost of other parts of the Work.

Should the Contractor fail to abate a dust nuisance the Project Manager may stop the Work until the issue is resolved to the City's satisfaction.

**GC - 26 - SITE CLEANUP AND RESTORATION** – The Contractor shall remove all debris and unused or discarded materials from the work site daily. Contractor shall clean the work site to remove all directional drilling "Driller's Mud" materials. No "Driller's Mud" residue shall be allowed to remain in the soil or on the surface of the land or vegetation. All debris and drilling materials must be disposed of offsite at an approved location.

The Contractor shall promptly restore all areas disturbed that are outside the Project limits in equal or better condition at no additional cost to the City.

**GC - 27 - COURTEOUS BEHAVIOR AND RESPECT FOR RESIDENTS AND PROPERTY** – The Contractor and its employees, associates and sub-contractors shall maintain courteous behavior at all times and not engage in yelling, loud music, or other such activities. Contractor's employees shall not leave trash or other discarded items at the Work Site, especially on any private property. In the event complaints arise, Contractor shall immediately remove such offending employees from the project if requested to do so by the Project Manager. Contractor's employees shall not trespass on any private property unless necessary to complete the work but with prior permission from the owner.

Contractor shall notify and obtain permission from the residents 24 hours in advance when planning to work within the resident's property. In addition, Contractor shall notify the resident prior to entering their property to perform work or inspect/investigate the work site. Contractor shall not block residents' driveways unnecessarily. Contractor shall not park equipment on landscaped areas when the vehicle is not needed for the current construction activities. Contractor shall be responsible for repair and/or replacement of all damaged landscaping within 48 hours including repairing vehicle wheel impressions, irrigation systems, lighting systems, structures, or any other items of resident's property. Contractor shall not destroy, damage, remove, or otherwise negatively impact any landscaping within or outside the right-of-way without prior approval from the Project Manager.

**GC - 28 - PLACING BARRICADES AND WARNING LIGHTS** - The Contractor shall furnish and place, at Contractor's 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 Project Manager 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 - 29 - 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

All traffic control devices, flashing lights, signs and barricades shall be maintained in working condition at all times and conform to Manual of Uniform Traffic Control Devices (MUTCD), latest edition.

**GC - 30 - COORDINATION** - The Contractor shall notify all utilities, transportation department, etc., in writing, with a copy to the Project Manager before construction is started and shall coordinate its 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 its Work and dispose of its materials so as to not interfere with the operation of other contractors engaged upon adjacent work, and to join its Work to that of others in a proper manner, and to perform its Work in the proper sequence in relation to that of other contractors as may be directed by the Project Manager.

Each Contractor shall be responsible for any damage done by it or its agents to the work performed by another contractor.

**GC - 31 - 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 - 32 - PROHIBITION AGAINST CONTRACTING WITH SCRUTINIZED COMPANIES** - As to any contract for goods or services of $1 million or more and as to the renewal of any contract for goods or services of $1 million or more, 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, and that it does not have business operations in Cuba or Syria, as provided in Section 287.135, Florida Statutes (2021), as may be amended or revised. As to any contract for goods or services of any amount and as to the renewal of any contract for goods or services of any amount, the Contractor certifies that it is not on the Scrutinized Companies that Boycott Israel List created pursuant to Section 215.4725, Florida Statutes (2021), as may be amended or revised, and that it is not engaged in a boycott of Israel. 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 (2021), 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 (2021), as may be amended or revised, 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 (2021), as may be amended or revised.

**GC - 33 - 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 - 34 - 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. In addition, the proposer agrees to defend, indemnify, and hold harmless the City and the City's officers, employees, and agents, against any loss or damages incurred by any person or entity as a result of the City's treatment of records as exempt from disclosure or confidential. Proposals purporting to be subject to copyright protection in full or in part will be rejected. The proposer authorizes the City to publish, copy, and reproduce any and all documents submitted to the City bearing copyright symbols or otherwise purporting to be subject to copyright protection.

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 AGREEMENT, CONTACT THE CUSTODIAN OF PUBLIC RECORDS AT:**

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

**Mailing Address:** **City Clerk's Office**
**100 N. Andrews Avenue**
**Fort Lauderdale, Florida 33301-1016**

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

Contractor shall:

1. Keep and maintain public records 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 (2021), 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 Agreement if the Contractor does not transfer the records to the City.

4. Upon completion of the Agreement, 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 Agreement, 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 Agreement, 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.

# SPECIAL CONDITIONS

## 01. PURPOSE

The City of Fort Lauderdale, Florida (City) is seeking bids from qualified bidders, **for** construction services in accordance with the terms, conditions, and specifications contained in this Invitation To Bid (ITB).

## 02. TRANSACTION FEES

The City 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 its 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, Florida 33301-1016, 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 **Mary Kay Kleinpeter-Zamora Procurement Administrator**, at (954) 828-_5189 or email at mkleinpeter-zamora@fortlauderdale.gov. Such contact shall be for clarification purposes only.

For information concerning technical specifications please utilize the Question/Answer platform 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). **Bidders 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 bidder 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 14 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 345 calendar days after the date when the Contract Time commences to run as provided in the Notice to Proceed.

**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, shall accompany each offer.

**07. REQUIRED LICENSES/CERTIFICATIONS**

Contractor must possess the following licenses/certifications to be considered for award:
State of Florida General Contractor License

***Note: Contractor must have proper licensing and shall submit evidence of same with its bid response.***

**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 the bid response.

DC Alexander Park is located between North Bound and South Bound State Road A1A, and directly across from the Fort Lauderdale Aquatic Center. Contractor shall have previous experience working in a coastal environment in high profile areas while maintaining pedestrian access in the Right-of-Way. Contractor shall have experience procuring and erecting decorative/architectural metal columns, beams, and cladding. Contractor shall experience performing onsite painting of the decorative metal in accordance with manufacturers specifications.

**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's permit fees exceed the allowance indicated, the City will reimburse the contractor the actual amount of the City's permit fees required for project completion.

| Allowances | $ |
|---|---|
| Permitting fees Allowance | $75,0000.00 |
| | |
| | |
| | |
| | |
| **Total** | $75,000.00 |

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

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

During the term of this Agreement, Contractor at its sole expense, shall provide insurance of such a type and with such terms and limits as noted below. Providing and maintaining adequate insurance coverage is a material obligation of Contractor. Contractor shall provide the City a certificate of insurance evidencing such coverage. Contractor's insurance coverage shall be primary insurance as respects to the City for all applicable policies. The limits of coverage under each policy maintained by Contractor shall not be interpreted as limiting Contractor's liability and obligations under this Agreement. All insurance policies shall be through insurers authorized or eligible to write policies in Florida and possess an A.M. Best rating of A-, VII or better, subject to the approval of the City's Risk Manager.

The coverages, limits and/or endorsements required herein protect the primary interests of the City, and these coverages, limits and/or endorsements shall in no way be required to be relied upon when assessing the extent or determining appropriate types and limits of coverage to protect the Contractor against any loss exposures, whether as a result of this Agreement or otherwise. The requirements contained herein, as well as the City's review or acknowledgement, is 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/coverages are required:

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

Policy must include coverage for Contractual Liability, Independent Contractors, and contain no exclusions for explosion, collapse, or underground.

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

The City, a political subdivision of the State of Florida, its officials, employees, and volunteers are to be covered as an additional insured 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, its officials, employees, or volunteers.

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.
Crane and Rigging Liability (if applicable)
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.

Workers' Compensation and Employer's Liability
Coverage must be afforded per Chapter 440, Florida Statutes. Any firm performing work 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 and its insurance carrier waive all subrogation rights against the City, a political subdivision of the State of Florida, its officials, employees, and volunteers for all losses or damages. The City requires the policy to be endorsed with WC00 03 13 Waiver of our Right to Recover from Others or equivalent.

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

For any Contractor who has exempt status as an individual, the City requires proof of Workers' Compensation insurance coverage for that Contractor's employees, leased employees, volunteers, and any workers performing work in execution of this Agreement.

If the Contractor has applied for a workers' compensation exemption, the City does not recognize this exemption to extend to the employees of the Contractor. The Contractor is required to provide proof of coverage for their employees, leased employees, volunteers and any workers performing work in execution of this Agreement. This applies to all contractors including but not limited to the construction industry.

Pollution and Remediation Legal Liability (If any Hazardous Materials)
For the purpose of this section, the term "hazardous materials" includes all materials and substances that are designated or defined as hazardous by Florida or Federal law or by the rules or regulations of Florida or any Federal Agency. If work being performed involves hazardous materials, the Contractor shall procure and maintain any or all of the following coverage, which will be specifically addressed upon review of exposure.

Contractors Pollution Liability Coverage
For sudden and gradual occurrences and in an amount not less than $1,000,000 per claim arising out of this Agreement, including but not limited to, all hazardous materials identified under the Agreement.

Asbestos Liability Coverage
For sudden and gradual occurrences and in an amount not less than $1,000,000 per claim arising out of work performed under this Agreement.

Disposal Coverage
The Contractor shall designate the disposal site and furnish a Certificate of Insurance from the disposal facility for Environmental Impairment Liability Insurance, covering liability for sudden and

accidental occurrences in an amount not less than $1,000,000 per claim and shall include liability for non-sudden occurrences in an amount not less than $1,000,000 per claim.

Hazardous Waste Transportation Coverage
The Contractor shall designate the hauler and furnish a Certificate of Insurance from the hauler for Automobile Liability insurance with Endorsement MCS90 for liability arising out of the transportation of hazardous materials in an amount not less than $1,000,000 per claim limit and provide a valid EPA identification number.

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 a Certificate of Insurance to the City with 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 shall indicate if coverage is provided under a claims-made or occurrence form. If any coverage is provided on a claims-made form, the certificate will show a retroactive date, which should be the same 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 Agreement, Bid/Contract number, event dates, or other identifying reference must be listed on the certificate.

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 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 an Umbrella/Excess insurance policy to comply with this requirement.

The Contractor's insurance coverage shall be primary insurance as respects to the City, a political subdivision of the State of Florida, its officials, employees, and volunteers. Any insurance or self-insurance maintained by the City, its officials, employees, or volunteers shall be excess of Contractor's insurance and shall be non-contributory.

Any exclusions or provisions in the insurance maintained by the Contractor that excludes coverage for work contemplated in this Agreement shall be deemed 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, and/or this Agreement is terminated. Any lapse in coverage shall be considered breach of contract. In addition, Contractor must provide 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.

All notices of any claim/accident (occurrences) associated with this Agreement, shall be provided to the Contractor's insurance company and the City's Risk Management office as soon as practical.

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

Bond Requirements

This Agreement is required to be bonded pursuant to Section 255.05, Florida Statutes, and the Contractor shall furnish Payment and Performance bonds on the City's standard form covering the full and faithful performance of the Agreement for construction and the payment of obligations arising hereunder.

All bonds must be underwritten by a surety company authorized to issue bonds in the State of Florida. The Contractor shall deliver required bonds to the City no later than thirty (30) days prior to the start of work contemplated in this Agreement.

If the Surety on any bond furnished by the Contractor is declared bankrupt, becomes insolvent, its right to do business is terminated in the State of Florida, or it ceases to meet the requirements of Section 255.05, Florida Statutes, the Contractor shall within five (5) days thereafter substitute Surety, both of which shall be acceptable to the City.

Loss Control/Safety

Precaution shall be exercised at all times by the Contractor for the protection of all persons, including employees, and property. The Contractor shall comply with all laws, regulations, or ordinances relating to safety and health, and shall make special effort to detect hazardous conditions and shall take prompt action where loss control/safety measures should reasonably be expected.

The City may order work to be stopped if conditions exist that present immediate danger to persons or property. The Contractor acknowledges that such stoppage will not shift responsibility for any loss or damages from the Contractor to the City.

**NOTE: CITY PROJECT NUMBER, PROJECT NAME AND BID NUMBER MUST APPEAR ON EACH CERTIFICATE, AND THE CITY OF FORT LAUDERDALE MUST BE NAMED ON THE CERTIFICATE AS AN "ADDITIONAL INSURED" ON GENERAL LIABILITY POLICIES.**

**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%

**12. CITY PROJECT MANAGER**

The Project Manager is hereby designated by the City as Tom Green whose address is, telephone number: (954) 828-4008_and e-mail address is tgreen@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 500 **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**

Payment on this Contract will be made by check.

**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:** $100/hr.

# 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 _____, a Florida _____ Company/Corporation (Contractor), ("Party" or collectively "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 – Advertisement for Invitation to Bids, the Instructions to Bidders, the Bid Form (with supplemental affidavits and sample 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 written document ordering a change in the Contract Price or Contract Time or a material change in the Work.

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, 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, 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 amount established in the bid submittal and award by the City's City Commission, its successors and assigns, as may be amended by Change Order.

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 – 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.

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 to Contractor authorizing the commencement of the activities identified in the notice or as described in the Contract Documents.

1.24 Plans - The official graphic representations of this Project that are a part of 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 construction project described in the Contract Documents, including the Work described therein.

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 a Professional Engineer or a Professional Land Surveyor licensed in the State of Florida and employed by the Contractor at no cost to the City.

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. If, at the time of inspection, it is determined the project is substantially completed, the City will issue a letter of Substantial Completion along with a punch list of incomplete or deficient items to be completed prior to requesting a Final Completion inspection.

1.32 Work – The construction and services required by the Contract Documents, whether completed or partially completed, and includes all labor, materials, equipment, and services provided or to be provided by Contractor to fulfill Contractor's obligations. The Work may constitute the whole or a part of the Project.

## 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:

DC Alexander Park Improvement Project
ITB # 12616-423
PROJECT #12373

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

PROJECT DESCRIPTION

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 all personnel employed.

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 Tom Green, whose address is xxxxxxxxxxxxand email address. 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 incorporated herein and attached to this Agreement, and consist of the following:

4.1 This Agreement.

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

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

4.4 Notice of Award and Notice to Proceed.

4.5 General Conditions and Special Conditions.

4.6 Technical Specifications.

4.7 Plans/Drawings.

4.8 Addenda number _____ through _____, inclusive.

4.9 Bid Form and supplement Affidavits and Agreements.

4.10 All applicable provisions of State and Federal Law.

4.11 Invitation to Bid No., 12616-423, Instructions to Bidders, and Bid Bond.

4.12 Contractor's response to the City's Invitation to Bid No., 12616-423, dated,xxxxxxx

4.13 Schedule of Completion.

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

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

4.16 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.

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

a. Approved change orders, addenda or amendments.

b. Specifications and Drawings.

c. Special Conditions.

d. General Conditions.

e. This Agreement dated _____, and any attachments.

f. Invitation to Bid No., 12616-423, and the specifications prepared by the City.

g. Contractor's response to the City's Invitation to Bid No., 12616-423, dated _____.

h. Schedule of Values.

i. 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, within five (5) calendar days, and before proceeding with the Work affected shall obtain a written interpretation or clarification from the City.

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 14 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 345 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 items 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 for 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-five percent (95%) 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 five percent (5%) 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 (2021), as amended or revised, provided, however, complete and error free pay application is submitted.

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7.7 The City shall make payment to the Contractor by check.

## 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, water table condition, moisture conditions and all year-round local weather and climate conditions (past and present), and 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 it 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 on its own, 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 it 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 it 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 Agreement 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 (MOT). 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 (MOT). Failure to pursue the Work with the properly certified supervisory staff may result in notice to stop work or terminate the Agreement 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 materials 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 8 a.m. and 5:00 p.m., Monday through Friday.

Unless approved by the City in advance, the Contractor will not perform 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. For any overtime inspection required by City personnel, 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., Monday through Friday, and any work requiring inspection oversight being performed outside of this timeframe shall be paid for by the Contractor as Inspector overtime at a rate of $100.00 per hour.** 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 hold 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 in conflict, the Contractor shall give the Project Manager prompt written notice thereof within five (5) calendar days, 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, standards, specifications and regulations, and without such notice to the Project Manager, the Contractor shall bear all costs arising therefrom.

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, and the 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 its 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 properties and areas 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 accumulation 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.
8.16.6 Coordination with and scheduling of all required inspections from all permitting agencies.

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. Section 9607, as amended or revised, 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 it 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 purpose, such acts or circumstances shall include, but not be limited to weather conditions affecting performance, floods, epidemics, pandemics, war, act of Governmental Authority, state of emergency, 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 seq.*).

Additionally, the Contractor assures that it, the sub recipient or the subcontractor shall not discriminate on the basis of race, color, national origin, or sex in the performance of this Agreement. 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 Agreement, which may result in the termination of this Agreement 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 shall provide public rights-of-way and easement, where available, for the installation of conduits, transformers pads and related appurtenances only.

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.

9.5 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.

## 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: 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 (2021), 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.

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.

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

During the term of this Agreement, Contractor at its sole expense, shall provide insurance of such a type and with such terms and limits as noted below. Providing and maintaining adequate insurance coverage is a material obligation of Contractor. Contractor shall provide the City a certificate of insurance evidencing such coverage. Contractor's insurance coverage shall be primary insurance as respects to the City for all applicable policies. The limits of coverage under each policy maintained by Contractor shall not be interpreted as limiting Contractor's liability and obligations under this Agreement. All insurance policies shall be through insurers authorized or eligible to write policies in Florida and possess an A.M. Best rating of A-, VII or better, subject to the approval of the City's Risk Manager.

The coverages, limits and/or endorsements required herein protect the primary interests of the City, and these coverages, limits and/or endorsements shall in no way be required to be relied upon when assessing the extent or determining appropriate types and limits of coverage to protect the Contractor against any loss exposures, whether as a result of this Agreement or otherwise. The requirements contained herein, as well as the City's review or acknowledgement, is 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/coverages are required:

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

Policy must include coverage for Contractual Liability, Independent Contractors, and contain no exclusions for explosion, collapse, or underground.

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

The City, a political subdivision of the State of Florida, its officials, employees, and volunteers are to be covered as an additional insured 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, its officials, employees, or volunteers.

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.
Crane and Rigging Liability (if applicable)
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.

Workers' Compensation and Employer's Liability
Coverage must be afforded per Chapter 440, Florida Statutes. Any firm performing work 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 and its insurance carrier waive all subrogation rights against the City, a political subdivision of the State of Florida, its officials, employees, and volunteers for all losses or damages. The City requires the policy to be endorsed with WC00 03 13 Waiver of our Right to Recover from Others or equivalent.

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

For any Contractor who has exempt status as an individual, the City requires proof of Workers' Compensation insurance coverage for that Contractor's employees, leased employees, volunteers, and any workers performing work in execution of this Agreement.

If the Contractor has applied for a workers' compensation exemption, the City does not recognize this exemption to extend to the employees of the Contractor. The Contractor is required to provide proof of coverage for their employees, leased employees, volunteers and any workers performing work in execution of this Agreement. This applies to all contractors including but not limited to the construction industry.

Pollution and Remediation Legal Liability (If any Hazardous Materials)
For the purpose of this section, the term “hazardous materials” includes all materials and substances that are designated or defined as hazardous by Florida or Federal law or by the rules or regulations of Florida or any Federal Agency. If work being performed involves hazardous materials, the Contractor shall procure and maintain any or all of the following coverage, which will be specifically addressed upon review of exposure.

Contractors Pollution Liability Coverage
For sudden and gradual occurrences and in an amount not less than $1,000,000 per claim arising out of this Agreement, including but not limited to, all hazardous materials identified under the Agreement.

Asbestos Liability Coverage
For sudden and gradual occurrences and in an amount not less than $1,000,000 per claim arising out of work performed under this Agreement.

Disposal Coverage
The Contractor shall designate the disposal site and furnish a Certificate of Insurance from the disposal facility for Environmental Impairment Liability Insurance, covering liability for sudden and accidental occurrences in an amount not less than $1,000,000 per claim and shall include liability for non-sudden occurrences in an amount not less than $1,000,000 per claim.

Hazardous Waste Transportation Coverage
The Contractor shall designate the hauler and furnish a Certificate of Insurance from the hauler for Automobile Liability insurance with Endorsement MCS90 for liability arising out of the transportation of hazardous materials in an amount not less than $1,000,000 per claim limit and provide a valid EPA identification number.

Insurance Certificate Requirements

q. 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.
r. The Contractor shall provide a Certificate of Insurance to the City with a thirty (30) day notice of cancellation; ten (10) days’ notice if cancellation is for nonpayment of premium.
s. 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.
t. 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.
u. The certificate shall indicate if coverage is provided under a claims-made or occurrence form. If any coverage is provided on a claims-made form, the certificate will show a retroactive date, which should be the same date of the initial contract or prior.
v. The City shall be named as an Additional Insured on all liability policies, with the exception of Workers’ Compensation.

w. The City shall be granted a Waiver of Subrogation on the Contractor's Workers' Compensation insurance policy.
x. The Agreement, Bid/Contract number, event dates, or other identifying reference must be listed on the certificate.

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 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 an Umbrella/Excess insurance policy to comply with this requirement.

The Contractor's insurance coverage shall be primary insurance as respects to the City, a political subdivision of the State of Florida, its officials, employees, and volunteers. Any insurance or self-insurance maintained by the City, its officials, employees, or volunteers shall be excess of Contractor's insurance and shall be non-contributory.

Any exclusions or provisions in the insurance maintained by the Contractor that excludes coverage for work contemplated in this Agreement shall be deemed 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, and/or this Agreement is terminated. Any lapse in coverage shall be considered breach of contract. In addition, Contractor must provide 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.

All notices of any claim/accident (occurrences) associated with this Agreement, shall be provided to the Contractor's insurance company and the City's Risk Management office as soon as practical.

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

Bond Requirements
This Agreement is required to be bonded pursuant to Section 255.05, Florida Statutes, and the Contractor shall furnish Payment and Performance bonds on the City's standard form covering the full and faithful performance of the Agreement for construction and the payment of obligations arising hereunder.

All bonds must be underwritten by a surety company authorized to issue bonds in the State of Florida. The Contractor shall deliver required bonds to the City no later than thirty (30) days prior to the start of work contemplated in this Agreement.

If the Surety on any bond furnished by the Contractor is declared bankrupt, becomes insolvent, its right to do business is terminated in the State of Florida, or it ceases to meet the requirements of Section 255.05, Florida Statutes, the Contractor shall within five (5) days thereafter substitute Surety, both of which shall be acceptable to the City.

Loss Control/Safety
Precaution shall be exercised at all times by the Contractor for the protection of all persons, including employees, and property. The Contractor shall comply with all laws, regulations, or ordinances relating to safety and health, and shall make special effort to detect hazardous conditions and shall take prompt action where loss control/safety measures should reasonably be expected.

The City may order work to be stopped if conditions exist that present immediate danger to persons or property. The Contractor acknowledges that such stoppage will not shift responsibility for any loss or damages from the Contractor to the City.

**NOTE: CITY PROJECT NUMBER, PROJECT NAME AND BID NUMBER MUST APPEAR ON EACH CERTIFICATE, AND THE CITY OF FORT LAUDERDALE MUST BE NAMED ON THE CERTIFICATE AS AN "ADDITIONAL INSURED" ON GENERAL LIABILITY POLICIES.**

**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 Project Manager 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 Paragraphs 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 it 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 Contract's 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, 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 trials 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 (2021), as may be amended or revised, 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, pandemics, act of Governmental Authority, state of emergency, 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 Agreement, 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 **500.00 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 makes a general assignment for the benefit of creditors.

17.2.2 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.

17.2.3 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.

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

17.2.5 If the Contractor repeatedly disregards proper safety procedures.

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

17.2.7 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 Agreement 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 has 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 City Project Manager and CONSULTANT shall be submitted to the City Manager or his designee and CONSULTANT's representative for resolution. Prior to any litigation being commenced, for any disputes which remain unresolved, within sixty (60) days after final completion of the Work, the Parties shall participate in mediation to address all unresolved disputes to a mediator agreed upon by the Parties. Should any objection not be resolved in mediation, the Parties retain all their legal rights and remedies provided under the laws of Florida. Failure by a Party to comply in strict accordance with the requirements of this Article, then said Party specifically waives all of its rights provided hereunder, including its rights and remedies under the laws of Florida.

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

18.1.2 During the pendency of any dispute and after a determination thereof, Contractor 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.

18.1.3 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 33301-1016

with copy to the:

Project Manager and City Attorney
City of Fort Lauderdale
100 North Andrews Avenue
Fort Lauderdale, Florida 33301-1016

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 (2021), as may be amended or revised, or to extend the City's liability beyond the limits established in said Section 768.28, Florida Statutes (2021), as may be amended or revised; 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; WAIVER OF JURY TRIAL

21.1 The Agreement shall be interpreted and construed in accordance with, and governed by, the laws of the state of Florida. The Parties agree that the exclusive venue for any lawsuit arising from, related to, or in connection with this Agreement shall be in the state courts of the Seventeenth Judicial Circuit in and for Broward County, Florida. If any claims arising from, related to, or in connection with this Agreement must be litigated in federal court, the Parties agree that the exclusive venue for any such lawsuit shall be in the United States District Court or United States Bankruptcy Court

for the Southern District of Florida. **BY ENTERING INTO THIS AGREEMENT, THE PARTIES HEREBY EXPRESSLY WAIVE ANY AND ALL RIGHTS EITHER PARTY MIGHT HAVE TO A TRIAL BY JURY OF ANY ISSUES RELATED TO THIS AGREEMENT. IF A PARTY FAILS TO WITHDRAW A REQUEST FOR A JURY TRIAL IN A LAWSUIT ARISING OUT OF THIS AGREEMENT AFTER WRITTEN NOTICE BY THE OTHER PARTY OF VIOLATION OF THIS SECTION, THE PARTY MAKING THE REQUEST FOR JURY TRIAL SHALL BE LIABLE FOR THE REASONABLE ATTORNEYS' FEES AND COSTS OF THE OTHER PARTY IN CONTESTING THE REQUEST FOR JURY TRIAL, AND SUCH AMOUNTS SHALL BE AWARDED BY THE COURT IN ADJUDICATING THE MOTION.**

## 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 as independent contractor 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: As to any contract for goods or services of $1 million or more and as to the renewal of any contract for goods or services of $1 million or more, 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, and that it does not have business operations in Cuba or Syria, as provided in Section 287.135, Florida Statutes (2021), as may be amended or revised. As to any contract for goods or services of any amount and as to the renewal of any contract for goods or services of any amount, the Contractor certifies that it is not on the Scrutinized Companies that Boycott Israel List created pursuant to Section 215.4725, Florida Statutes (2021), as may be amended or revised, and that it is not engaged in a boycott of Israel. 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 (2021), 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 (2021), as may be amended or revised, 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 (2021), as may be amended or revised.

22.8 Public Entity Crimes: In accordance with the Public Crimes Act, Section 287.133, Florida Statutes (2021), as may be amended or revised, 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 (2021), as may be amended or revised, 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 Contractor 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 AGREEMENT, 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 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 (2021), 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 Agreement if the Contractor does not transfer the records to the City.

4. Upon completion of the Agreement, 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 Agreement, 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 Agreement, 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.

**[THIS SPACE WAS INTENTIONALLY LEFT BLANK]**

Project Name
(Contractor)
Project #

**CITY**

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

CITY OF FORT LAUDERDALE, a Florida municipal corporation

By: _____
CHRISTOPHER J. LAGERBLOOM
City Manager

Date: _____

ATTEST:

By: _____
JEFFREY A. MODARELLI
City Clerk

Approved as to Legal Form:
Alain E. Boileau, City Attorney

By:_____
RHONDA MONTOYA HASAN
Assistant City Attorney

**CONTRACTOR**

WITNESSES:

CONTRACTOR.,
a Florida company/corporation.

_____ By:_____

_____ Print Name:_____
Print Name

Title:_____

ATTEST:

_____

_____
Print Name

By:_____
Secretary

(CORPORATE SEAL)

STATE OF _____:

COUNTY OF _____:

The foregoing instrument was acknowledged before me by means of ☐ physical presence or ☐ online notarization, this _____ day of _____, 2021, by _____, (NAME OF AUTHORIZED OFFICER) as _____ (TITLE OF AUTHORIZED OFFICER), for _____ (NAME OF COMPANY), a Florida _____(TYPE OF COMPANY).

_____
(Signature of Notary Public - State of Florida)

_____
(Print, Type, or Stamp Commissioned Name of Notary Public)

Personally Known_____ OR Produced Identification_____
Type of Identification Produced: _____

***CITY OF FORT LAUDERDALE CONTRACT AND SPECIFICATIONS PACKAGE***

# SPECIFICATIONS PACKAGE

# PROJECT NO. 12373

# DC ALEXANDER PARK PROJECT

**Issued on Behalf of:**
**Community Redevelopment Agency and Parks and Recreation**
**701 South Andrews Avenue**
**Fort Lauderdale, Florida 33316**

**Tom Green, Project Manager**

**Mary Kleinpeter-Zamora**
**Procurement Administrator**
**Telephone: (954) 828-5189**
**mkleinpeter-zamora@fortlauderdale.gov**

**SPECIFICATIONS**
**DIVISION 01 - GENERAL REQUIREMENTS**

**NOTE: ALL CIVIL ENGINEERING RELATED SPECIFICATIONS ARE LOCATED IN THE TECHNICAL DRAWINGS PACKAGE AND ARE TO PREVAIL. ANY AND ALL SPECIFICATIONS IN SECTIONS HEREIN ARE TO BE SECONDARY OR SUPPLIMENTARY TO ANY SPECIFICATION REQUIREMENTS IN THE CIVIL ENGINEER'S TECHNICAL DRAWINGS.**

| | |
|---|---|
| Section 01001 | General Requirements |
| Section 01005 | Technical Provisions |
| Section 01010 | Summary |
| Section 01025 | Measurement and Payment |
| Section 01031 | Alteration Project Procedures |
| Section 01040 | Coordination |
| Section 01045 | Cutting and Patching |
| Section 01060 | Regulatory Requirements and Permits |
| Section 01070 | Abbreviations of Institutions |
| Section 01090 | Reference Standards |
| Section 01152 | Application for Payment |
| Section 01200 | Project Meetings |
| Section 01311 | Construction Process Documentation |
| Section 01 31 00 | Project Management and Coordination |
| Section 01320 | Project Record Documents |
| Section 01 33 00 | Submittal Procedures |
| | *Submittal Transmittal* |
| | *Subcontractors and Major Materials Suppliers List* |
| Section 01380 | Construction Photographs |
| Section 01 40 00 | Quality Requirements |
| Section 01410 | Testing Laboratory Services |
| Section 01 43 39 | Mock-Ups |
| Section 01 50 00 | Temporary Facilities and Controls |
| Section 01505 | Mobilization |
| Section 01510 | Temporary Utilities |
| Section 01520 | Construction Aids |
| Section 01530 | Protection of Existing Facilities |
| Section 01550 | Site Access and Storage |
| Section 01 55 00 | Vehicular Access and Parking |
| Section 01 55 26 | Traffic Control |
| Section 01560 | Temporary Controls |
| Section 01 56 39 | Temporary Tree and Plant Protection |
| Section 01570 | Traffic Regulations |
| Section 01 57 13 | Temporary Erosion and Sediment Control |
| Section 01590 | Project Sign |
| Section 01 60 00 | Product Requirements |
| | Substitution Request |
| Section 01 70 00 | Execution Requirements |
| | Request for Interpretation |
| Section 01710 | Cleaning |
| Section 01780 | Contract Closeout |
| | Subcontractor Identification Form |
| Section 01 78 23 | Operation and Maintenance Data |
| Section 01 78 39 | Project Record Documents |
| Section 01 79 00 | Demonstration and Training |

**DIVISION 02 - EXISTING CONDITIONS**

Not Used.

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| Section 03 20 00 | Concrete Reinforcement |
| Section 03 30 00 | Cast-in-Place Concrete – Site |
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| Section 03 45 00 | Custom Precast Concrete |

**DIVISION 04 - MASONRY**

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| Section 05 12 00 | Structural Steel |
| Section 05 40 16 | Custom Cold Form Metal Framing |
| Section 05 50 00 | Metal Fabrications |
| Section 05 52 00 | Aluminum Handrails and Railings |
| Section 05 52 13 | Pipe and Tube Railing |

**DIVISION 06 - WOOD AND PLASTICS**

Not Used.

**DIVISION 07 - THERMAL AND MOISTURE PROTECTION**

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| Section 07 55 56 | Fluid Applied Protected Membrane Roofing |
| Section 07 92 00 | Joint Sealants |

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| Section 22 05 17 | Sleeves and Sleeve Seals for Plumbing Piping |
| Section 22 05 18 | Escutcheons for Plumbing Piping |
| Section 22 05 19 | Meters and Gages for Plumbing Piping |
| Section 22 05 23 | Ball Valves for Plumbing Piping |
| Section 22 05 29 | Hangers and Supports for Plumbing Piping and Equipment |
| Section 22 05 53 | Identification for Plumbing Piping and Equipment |
| Section 22 11 16 | Domestic Water Piping |
| Section 22 11 19 | Domestic Water Specialties |
| Section 22 11 23.21 | Inline, Domestic-Water Pumps |
| Section 22 13 16 | Sanitary Waste and Vent Piping |
| Section 22 13 19 | Sanitary Waste Piping Specialties |
| Section 22 14 13 | Facility Storm Drainage Piping |
| Section 22 14 23 | Storm Drainage Piping Specialties |
| Section 22 42 13.13 | Commercial Water Closets |
| Section 22 42 13.16 | Commercial Urinals |
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**DIVISION 23 - HEATING, VENTILATING AND AIR CONDITIONING (HVAC)**

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| Section 23 05 13 | Common Motor Requirements For HVAC Equipment |
| Section 23 05 17 | Sleeves and Sleeve Seals for HVAC Piping |
| Section 23 05 18 | Escutcheons for HVAC Piping |
| Section 23 05 23 | General-duty Valves for HVAC Piping |
| Section 23 05 53 | Identification for HVAC Piping and Equipment |
| Section 23 05 93 | Testing, Adjusting, and Balancing for HVAC |
| Section 23 07 16 | HVAC Equipment Insulation |
| Section 23 07 19 | HVAC Piping Insulation |
| Section 23 31 13 | Metal Ducts |
| Section 23 33 00 | Air Duct Accessories |
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| Section 26 00 00 | Electrical Requirements |
| Section 26 05 19 | Low-voltage Electrical Power Conductors and Cables |
| Section 26 05 23 | Control-Voltage Electrical Power Cables |
| Section 26 05 26 | Grounding and Bonding Electrical Systems |
| Section 26 05 29 | Hangers and Supports for Electrical Systems |
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| Section 26 51 00 | Interior Lighting |
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| Section 32 13 14 | Exposed Aggregate Concrete Paving |
| Section 32 13 73 | Concrete Paving Joint Sealants |
| Section 32 14 13 | Concrete Unit Paving |
| Section 32 15 44 | Crushed Shell Paving |
| Section 32 17 26 | Tactile Warning Surfacing |
| Section 32 18 13 | Synthetic Grass Surfacing |
| Section 32 18 16 | Playground Protective Surfacing |
| Section 32 8 400 | Irrigation |
| Section 32 91 19 | Landscape Grading |
| Section 32 92 00 | Turf and Grasses |
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**DIVISION 33 - 50**

Not Used

**APPENDICES**



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**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/certifications.**

Attachment 1 - CITB Prime Contractor ID Form
Attachment 2 - CITB Questionnaire Sheets
Attachment 3 - CITB Local Business Preference
Attachment 4 - CITB Trench Safety
Attachment 5 - CITB Non-Collusion Statement
Attachment 6 - CITB Contract Payment Method
Attachment 7 - CITB Construction Bid Certification

# SECTION 01001 - GENERAL REQUIREMENTS

## PART 1 PROJECT DESCRIPTION

1.1 GENERAL

A. A brief description of the Work is stated in the INVITATION TO BID. To determine the full scope of the project or any particular part of the project, coordinate the applicable information in these Contract Documents and review the available project drawings.

B. The Work under this Contract shall be performed by the CONTRACTOR as required by the City of Fort Lauderdale (City). Work will be authorized by a Notice to Proceed (NTP) issued to the CONTRACTOR. The CONTRACTOR shall complete all work within the number of calendar days stipulated in the Contract unless an extension in the time of completion is granted by the CITY'S PROJECT MANAGER, as stated in the Instructions to Bidders. Upon satisfactory completion of the work and compliance with applicable provisions in the Contract Documents, the CONTRACTOR will receive final payment for all work done.

C. The following additional information, though not all-inclusive, is given to assist contractors in their evaluation of the work required to meet the project objectives.

D. The CONTRACTOR shall become familiar with the existing operating conditions of the City's water system, sewage transmission system and pumping stations and take such into consideration in planning and scheduling work. No extra claims shall be made for work required to achieve conditions beyond those obtainable under normal operation of the existing transmission, collection and pumping facilities necessary to accomplish the Work.

E. Contractor shall be required to submit a Maintenance of Traffic (MOT) plan for work in the county and state highways and City streets. Contractor shall coordinate with MOTs for nearby or highway work and obtain approval for all traffic control as required by the permits contained elsewhere in this Section.

## PART 2 SEQUENCE OF OPERATIONS

2.1 SCHEDULING

A. General: Prepare and submit schedule in accordance with the provisions of Section 01311, Construction Progress Documentation.

B. Plan the work and carry it out with minimum interference to the operation of the existing facilities. Prior to starting the work, confer with the CITY'S ENGINEER to develop an approved work schedule, which will permit the facilities to function normally as practical. It may be necessary to do certain parts of the construction work outside normal working hours in order to avoid undesirable conditions. The Contractor shall do this work at such times and at no additional cost to the City. Do not make connections between existing work and new work

until necessary inspection and tests have been completed on the new work and it is found to conform in all respects to the requirements of the Contract Documents.

C. No work shall be started until the CONTRACTOR has received approved shop drawings, established material/delivery dates for all equipment, and received approval of the construction schedule from the ENGINEER. The Contractor shall have sufficient manpower, equipment, and material to complete the project.

D. No work shall commence without express consent of the CITY'S ENGINEER.

E. If a privately owned staging area is required, no work shall commence until approval of the facility is obtained from City Planning and Zoning in accordance with Section 47-19.2 of the Unified Land Development Regulations. Submit a copy of the approval and agreement to the CITY'S ENGINEER.

2.2 MOBILIZATION AND DEMOBILIZATION

A. CONTRACTOR shall be responsible for mobilization and demobilization of labor, materials and equipment. Payment for mobilization and demobilization shall be included in the lump sum price indicated in the Proposal for the project.

2.3 COORDINATION

A. CONTRACTOR shall cooperate in the coordination of separate activities in a manner that will provide the least interference with the Owner's operations and other contractors and utility companies working in the area, and in the interfacing and connection of the separate elements of the overall project work.

B. If any difficulty or dispute should arise in the accomplishment of the above, the problem shall be brought immediately to the attention of the CITY'S ENGINEER.

2.4 OPERATION OF EXISTING SYSTEM PROHIBITED

A. At no time is the CONTRACTOR to undertake to close off any utility lines or open valves or take any other action, which would affect the operation of existing systems. The City's operations crew will operate all valves. Provide at least one business day notice to City prior to any operations.

**PART 3 SITE CONDITIONS**

3.1 SITE INVESTIGATION AND REPRESENTATION

A. The CONTRACTOR acknowledges satisfaction as to the general nature and location of the work, the general and local conditions, particularly those bearing upon availability of transportation, availability of labor, water, electric power, roads, and uncertainties of weather, river stages, or similar physical conditions, the character of equipment and facilities needed preliminary to and during the prosecution of the work, and all other matters which can in any way affect the work or the cost thereof under this Contract.

B. Failure by the CONTRACTOR to become acquainted with the physical conditions and all the available information will not relieve the CONTRACTOR from responsibility for properly estimating the difficulty or cost of successfully performing the Work.

C. The CONTRACTOR warrants that as a result of examination and investigation of all the aforesaid data, the Contractor can perform the work in a good and workmanlike manner and to the satisfaction of the City. The City assumes no responsibility for any representations made by any of its officers or agents during or prior to the execution of this Contract, unless (1) such representations are expressly stated in the Contract; and (2) the Contract expressly provides that the responsibility therefore is assumed by the City.

3.2 INFORMATION ON SITE CONDITIONS

A. General: Information obtained by the CITY'S ENGINEER regarding site conditions, subsurface information, groundwater elevations, existing construction of site facilities, as applicable, and similar data will be available for inspection at the office of the CITY'S ENGINEER upon request. Such information is offered as supplementary information only. The CITY'S ENGINEER does not assume any responsibility for the completeness or interpretation of such supplementary information.

3.3 UTILITIES

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

B. The CONTRACTOR shall contact potentially affected utilities as provided in Section 01060, Regulatory Requirements & Permits.

C. The CONTRACTOR shall contact Sunshine State One Call at 811 or visit www.callsunshine.com at least 2 business days (10 business days for water crossings) prior to any excavation and make arrangements for locating all utilities in the project area.

3.4 CONTRACTOR'S RESPONSIBILITY FOR UTILITY PROPERTIES AND SERVICE

A. Where the Contractor's operations could cause damage or inconvenience to utilities, telephone, television, power, water, or sewer systems, the operations shall be suspended until all arrangements necessary for the protection of these utilities and services have been made by the CONTRACTOR with the owner of the utility affected.

B. Notify all utility offices, which are affected by the construction operation at least 2 business days in advance. Under no circumstances expose any utility without first obtaining permission from the appropriate agency. Once permission has been granted, locate, expose, and provide temporary support for all existing underground utilities.

C. The CONTRACTOR shall be solely and directly responsible to the Owner and operators of such properties for any damage, injury, expense, loss, inconvenience, delay, suits, actions, or claims of any character brought because of any injuries or damage, which may result from the construction operations under this Contract.

D. Neither the Owner nor its officers or agents shall be responsible to the CONTRACTOR for damages as a result of the Contractor's failure to protect utilities encountered in the Work.

E. In the event of interruption to domestic water, sewer, storm drain, or other utility services as a result of accidental breakage due to construction operations, promptly notify the proper authority. Cooperate with said authority in restoration of service as promptly as possible and bear all costs of repair. In no case shall interruption of any water or utility service be allowed to exist outside working hours unless prior approval is granted.

F. In the event the CONTRACTOR encounters water service lines or sewer laterals that interfere with trenching, he may, by obtaining prior approval of the property owner, and the CITY'S ENGINEER, cut the service, dig through, and restore the service with similar and equal materials at the Contractor's expense.

G. The Contractor shall replace, at his own expense, all existing utilities or structures removed or damaged during construction, unless otherwise provided for in these Contract documents or ordered by the City's Engineer.

H. Telephone and communications drops and signal systems may extend throughout the project area. Properly located cable, conduit, interface equipment, pull or junction boxes and other signal or systems equipment damaged by the Contractor shall be replaced at the Contractor's expense.

a. Damaged cable shall be replaced as an entire run, from junction box to junction box.

b. Notify Broward County Engineering two business days in advance of the need to remove traffic detection loops.

c. Contractor shall verify marked cables and signal systems prior to excavation.

3.5 INTERFERING STRUCTURES

A. Take necessary precautions to prevent damage to existing structures whether on the surface, aboveground, or underground.

B. Protect underground and aboveground existing structures from damage, whether or not they lie within the limits of the easements obtained by the City. Where such existing fences, gates, sheds, buildings, or any other structure must be removed in order to properly carry out the construction, or are damaged during construction, restore to their original condition to the satisfaction of the property owner involved at the Contractor's own expense. Notify the City of any damaged underground structure, and make repairs or replacements before backfilling.

C. Without additional compensation, the Contractor may remove and shall replace in a condition as good as or better than original, such small miscellaneous structures as fences, mailboxes, and signposts that interfere with the Contractor's operations.

3.6 EASEMENTS AND WORK ON PRIVATE PROPERTY

A. Where portions of the work are located on public or private property, easements and permits will be obtained by the City, except as otherwise noted in these Specifications. Easements will provide for the use of property for construction purposes to the extent indicated on the easements. Copies of these easements and permits are available upon request to the City. It shall be the Contractor's responsibility to determine the adequacy of the easement obtained in every case and to abide by all requirements and provisions of the easement. The Contractor shall confine his construction operations to within the easement limits or street right-of-way limits or make special arrangements with the property owners or appropriate public agency for the additional area required. Any damage to property, either inside or outside the limits of the easements provided by the City or street rights-of-way, shall be the responsibility of the Contractor as specified herein. The Contractor shall provide immediate notice to the owner of any damage to fencing and provide temporary fencing as required to provide a functionally similar level of security. The Contractor shall remove, protect, and replace all fences or other items encountered on public or private property. Before final payment will be authorized by the City's Engineer, the Contractor will be required to furnish the City with written releases from property owners or public agencies where side agreements or special easements have been made by the Contractor or where the Contractor's operations, for any reason, have not been kept within the construction right-of-way obtained by the City or the street right-of-way.

B. The Contractor shall be responsible for all damage to private property where work related activities have occurred without proper easement or authorization. The City may withhold payment to the Contractor pending resolution of any claims by private owners.

C. It is anticipated that the required easements and permits will be obtained before construction is started. However, should the procurement of any easement or permit be delayed, the Contractor shall schedule and perform the work around these areas until such a time as the easement or permit has been secured.

D. Prior to removing an existing structure or item, provide written notice to the Owner at least 14 days in advance of the anticipated removal.

E. The Contractor shall not engage in private construction activities within the project area without the presence of a contract with the private owner of the property containing a hold harmless clause protecting the City from any and all damages that occur during the performance of the privately authorized work.

## PART 4 SAFETY AND CONVENIENCE

## 4.1 SAFETY AND ACCESS

A. The Contractor shall do all work necessary to protect the general public from hazards, including, but not limited to, surface irregularities or unramped grade changes in pedestrian sidewalk or walkway, and trenches or excavations in roadway. Barricades, lanterns, and proper signs shall be furnished in sufficient amount to safeguard the public and the work. All barricades and signs shall be clean and serviceable, in the opinion of the City's Engineer.

B. During construction, the Contractor shall construct and at all times maintain satisfactory and substantial temporary chain link fencing, solid fencing, railing, barricades or steel plates, as applicable, at all openings, obstructions, or other hazards in streets, sidewalks, floors, roofs, and walkways. All such barriers shall have adequate warning lights as necessary, or required, for safety. All lights shall be regularly maintained, and in a fully operational state at all times.

C. The Contractor shall notify all residences and businesses of planned construction at least 5 (five) business days prior to the start of work in the block where they are located. Such notices shall be brochures or door-hangers with sufficient information to describe the extent and duration of the planned work. Notification activities shall be coordinated with the CITY'S ENGINEER.

D. Homeowners and business owners shall be provided reasonable access. The Contractor shall provide temporary sidewalks, bridges or driveway access, including safe passage over open excavations as required.

## 4.2 ACCIDENT REPORTS

A. In addition, the Contractor must promptly report in writing to the CITY'S ENGINEER all accidents whatsoever arising out of, or in connection with, the performance of the work whether on, or adjacent to, the site, giving full details and statements of witnesses. If death or serious injuries or serious damages are caused, the accident shall be reported immediately by telephone or messenger to the ENGINEER.

B. If a claim is made by anyone against the contractor or any subcontractor on account of any accident, the Contractor shall promptly report the facts in writing to the CITY'S ENGINEER, giving full details of the claim.

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

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

## 4.4 PROTECTION OF PROPERTY

A. Protect stored materials located adjacent to the proposed work. Notify property owners affected by the construction at least two business days in advance of the time construction begins. During construction operations, construct and maintain such facilities as may be required to provide access by all property owners to their property. No person shall be cut off from access to his residence or place of business for a period exceeding 2 hours, unless the Contractor has made special arrangements with the affected persons.

B. The Contractor shall identify and isolate his active work zone in such a manner as to exclude all personnel not employed by him, the CITY'S ENGINEER, and the City.

4.5 FIRE PREVENTION AND PROTECTION

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

4.6 ACCESS FOR POLICE, FIRE, AND POSTAL SERVICE

A. Notify the fire department and police department before closing any street or portion thereof. No closing shall be made without the Owner's approval of MOT plan. Notify said departments when the streets are again passable for emergency vehicles. Do not block off emergency vehicle access to consecutive arterial crossings or dead-end streets, in excess of 300 linear feet, without special written permission from the fire department. Conduct operations with the least interference to fire equipment access, and at no time prevent such access. MOT plans that result in restricted access for emergency vehicles must be submitted and approved 2 weeks prior to the proposed closing with separate and specific notification made to the ENGINEER to provide for appropriate agency coordination.

B. The Contractor shall leave a night emergency telephone number or numbers with the police department, the Engineer, and the Owner, so that contact may be made easily at all times in case of barricade and flare trouble or other emergencies.

C. Maintain postal service facilities in accordance with the requirements of the U.S. Postal Service. Move mailboxes to temporary locations designated by the U.S. Postal Service, and at the completion of the work in each area, replace them in their original location and in a condition satisfactory to the U.S. Postal Service.

## PART 5 PRESERVATION, RESTORATION, AND CLEANUP

5.1 SITE RESTORATION AND CLEANUP

A. At all times during the work, keep the premises clean and orderly, and upon completion of the Work, repair all damage caused by equipment and leave the project free of rubbish or excess materials of any kind.

B. Stockpile excavated materials in a manner that will cause the least damage to adjacent lawns, grassed areas, gardens, shrubbery, or fences, regardless of whether these are on private property, or on state, county, or city rights-of-way. Remove all excavated materials from grassed and planted areas, and leave these surfaces in a condition equivalent to their original condition. Replace excavated areas, raked and graded to conform to their original contours.

5.2 FINISHING OF SITE, BORROW, AND STORAGE AREAS

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

5.3 HISTORIC PRESERVATION

A. The Contractor shall coordinate with the historic preservation representative supplied by the owner for initial excavation operations. If the project work should uncover prehistoric or historic artifacts associated with Native American cultures, early colonial cultures, or American settlements, all project activities in the area shall cease immediately.

B. All such discoveries shall be reported to the Division of Historical Resources. Review and Compliance Section at (800) 847-7278.

C. Project activities in the affected area cannot resume without authorization from the Division of Historic Resources.

**PART 6 PERMITS**

6.1 GENERAL

A. City has prepared the following application for the Contractor to submit and obtain Permit:
   a. BLD-CNC-21050005.

B. Permits to be obtained by the Contractor include, but are not limited to the following:

   a. Local, County, and State contracting licenses as required.
   b. MOT approval from local, county, and state agencies as required.
   c. Broward County Planning and Environmental Regulation Division (BCPERD): Dewatering permit, including National Pollution Discharge

Elimination System (NPDES) permit if required.

d. Environmental Recourse Permit if necessary.

C. The Contractor shall comply with all applicable permit conditions.

**END OF SECTION**

# SECTION 01005 - TECHNICAL PROVISIONS

## PART 1 GENERAL

### 1.1 SCOPE

A. Work under this contract includes furnishing materials, labor, tools equipment, supervision and incidentals necessary to construct infrastructure improvements.

### 1.2 ITEMS SPECIFIED ON DRAWINGS

A. Items of material, equipment, machinery and the like may be specified on the Drawings and not in the Technical Specifications. The CONTRACTOR shall provide such items in accordance with the General Notes on the Drawings.

### 1.3 FIELD LAYOUT OF THE WORK AND RECORD DRAWINGS

A. After completion of construction, the CONTRACTOR shall provide three (3) sets of signed & sealed. As-Built Drawings with all the As-Built information; all locations, coordinates, dimensions and elevations of the constructed facilities, certified, signed and sealed thereon by a Land Surveyor registered in the State of Florida. All elevations shall refer to N.A.V.D. 88 (North American Vertical Datum of 1988) and all state plane coordinates shall be NAD 83 (with 1990 adjustment). The cost of such field layout and recording work shall be the responsibility of the CONTRACTOR. The As-Built utility information shall meet the requirements of the City of Fort Lauderdale and any other permitting agencies having jurisdiction on this project.

### 1.4 SALVAGE

A. Any existing equipment or material, including but not limited to valves, pipes, fittings, couplings, etc., which is removed as a result of construction under this project may be designated as salvage by the CONTRACT ADMINISTRATOR, and if so, shall be delivered clean to the CITY at a location directed by the CONTRACT ADMINISTRATOR. Any equipment or material not worthy of salvaging shall be disposed of by the CONTRACTOR at a suitable location in accordance with all applicable regulations, ordinances and laws at no additional cost to the CITY.

### 1.5 POWER

A. The CONTRACTOR shall furnish and pay for all electrical power required for the construction, testing and trial operation, prior to final acceptance by the CITY.

### 1.6 WATER SUPPLY

A. All water required for testing, flushing, and construction shall be furnished by the CITY and paid for by the CONTRACTOR. The purchase price shall be the prevailing rate as published by the CITY. The quantity of water used shall be determined by reading the meter at the start and at the finish of construction. The

CONTRACTOR shall make all arrangements and incur all expense involved in having the CITY provided with a vacuum relief or backflow preventer which shall meet the requirements of ASA A40.6, latest revision, and the local administrative authority.

1.7 MAINTENANCE

A. The CONTRACTOR shall fully cooperate at all times with the CITY in order to maintain the operation of the existing water and/or sewer system with the least amount of interference and interruption possible. The schedule plans and work of the CONTRACTOR shall at all times be subject to alteration and revision if necessary for public health and safety considerations. The creation of a public nuisance will not be permitted.

B. It may be necessary to interrupt the operation of the existing water and/or sewer system. In all cases where the CONTRACTOR must cause an interruption, CONTRACTOR shall prepare and submit to the CITY'S ENGINEER four (4) working days prior to commencing the work, a complete description of the proposed procedure and a time schedule, which CONTRACTOR will guarantee. At least forty-eight (48) hours prior to the time proposed for starting the work, the CITY'S ENGINEER will notify the CONTRACTOR whether or not the work will be permitted as proposed.

a. The CITY'S ENGINEER reserves the right to require the CONTRACTOR to work 24 hours per day in all cases where, in ENGINEER'S opinion, interference with operation of the system may result in dangerous health hazards or offensive conditions.

b. In no case will the CONTRACTOR be permitted to interfere with the existing system until all materials, supplies, equipment, tools and incidentals necessary to complete the work are on the site. Backup equipment on key equipment items shall be required on work necessitating interference with the existing system.

1.8 SITE RESTORATION

A. The CONTRACTOR shall remove all excess material and shall clean up and restore the site to its original condition or better. All damage, as a result of work under this Contract, done to existing structures, pavement, driveways, paved areas, curbs and gutters, sidewalks, shrubbery, grass, trees, utility poles, utility pipe lines, conduits, drains, catch basins, flagstones, rocked, graveled, or stabilized areas of driveways, and including all obstructions not specifically named herein, shall be repaired, or replaced, as determined by the CITY'S ENGINEER. Site restoration shall be done in a timely manner as the work progresses. Site restoration work shall be completed on private property within 30 days after being disturbed.

1.9 SANITARY FACILITIES

A. The CONTRACTOR shall provide temporary facilities at the site as directed by the CITY'S ENGINEER.

1.10 STANDARDS

A. Wherever in these TECHNICAL SPECIFICATIONS or in the drawings name and/or number refer to certain standards or regulations, the applicable publication shall be the latest revision thereof. Reference by abbreviation is made in accordance with the Section 01070, "Abbreviations of Institutions."

1.11 QUALITY OF ITEMS

A. All material furnished for this project shall be new and unused. Any material, which has become excessively weathered or damaged since manufacture, shall not be considered as new. CITY'S ENGINEER shall be the sole judge as to what constitutes excessive weathering or damage.

1.12 TESTING

A. The City of Fort Lauderdale Engineering Minimum Design and Construction Standards may require that materials and equipment supplied meet given standards and testing to demonstrate conformance to the standards is a part of those standards. The cost of these tests shall be the obligation of the CONTRACTOR and no extra charge shall be made to the CITY on account of such testing.

B. The CONTRACTOR shall select a recognized, independent testing laboratory to make tests on concrete, asphalt, soils and other materials for the construction phase, to test for conformity with the TECHNICAL SPECIFICATIONS, FDOT and BROWARD COUNTY Construction Standards, and any other applicable testing/Quality control standards as required by all permitting agencies having jurisdiction over this project. The CONTRACTOR shall supply the necessary samples for this testing without cost to the CITY. The costs for actual testing shall be paid by the CONTRACTOR and scheduling of all required tests will be the responsibility of the CONTRACTOR.

C. Construction in areas where installation and restoration must satisfy the additional requirements of a local, state or federal authority may require testing to demonstrate conformance. The CONTRACTOR shall ascertain the extent of testing required by regulatory agencies within these areas. The CONTRACTOR is responsible for performing such tests, including but not limited to, tests of compaction, and all costs for these tests shall be the obligation of the CONTRACTOR and no extra charge shall be made to the CITY on account of such testing.

1.13 UTILITY CROSSINGS

A. It is intended that wherever existing utilities must be crossed that the pipe may be deflected up to 75% of the manufacturer's recommended limits, but shall not exceed the allowable limits of the CITY. Adequate cover shall be used to adequately clear the obstruction. However, when in the opinion of the CITY'S ENGINEER, this procedure is not feasible CITY'S ENGINEER may direct the use

of fittings to clear a utility crossing as detailed on the Drawings. The cost of such crossing including joint restraints shall be on the basis of the schedule of pay items applied.

B. Deflections and adjustments of the proposed water and/or sewer mains to avoid all other existing utilities shall be verified/determined in the field during construction.

1.14 BASIS OF MEASUREMENT

A. Where mains are to be paid for on a unit price per linear foot basis, the number of linear feet will be determined by measurement along the centerline of the pipe in place, including fittings. Square yardage will be determined by the actual number of square yards installed.

1.15 ADJUSTMENT AND RELOCATION OF EXISTING LINES

A. When the drawings indicate that existing lines must be deflected, the pipe may be deflected up to 75% of the manufacturer's recommended limits but shall not exceed the allowable limits of the CITY. The CONTRACTOR will need to be directed by the ENGINEER. If the ENGINEER determines that the use of new pipe and fittings is required for deflection, the CONTRACTOR will be directed to use this method. The price for either method shall be based upon the unit prices bid. This does not apply to connections to existing system (Paragraph 1.17, this Section).

1.16 CONNECTION TO EXISTING SYSTEM

A. The CONTRACTOR shall perform all work necessary to locate, excavate and prepare for connection to the existing mains as shown on the Drawings. The cost of this work and for the actual connection to the existing main shall be based upon the unit prices for installing the pipe and appurtenances and shall not result in any additional cost to the CITY. The cost of ductile iron sleeves shall be included in the fittings unit price.

B. Additional valves used for the CONTRACTOR's convenience shall not be considered as an extra cost payable by the CITY for the tie-in to the existing system.

C. During all phases of the work, (i.e. installation, testing and restoration), the CONTRACTOR shall ensure at all times the safe operation of the existing water and/or sewage systems. Service to the customers shall be maintained with the least amount of interference and interruption as possible.

1.17 RELOCATIONS

A. The CONTRACTOR shall be responsible for the relocation of structures that are shown on the drawings, including, but not limited to, light poles, signs, fences, piping, conduits and drains that interfere with the proposed positioning of the water/sewer mains. The cost of all such relocations shall be included in the

prices bid for the appropriate items.

1.18 UTILITIES

A. Existing utilities are shown on the Drawings insofar as information is reasonably available; however, it will be the responsibility of the CONTRACTOR to preserve all existing utilities whether shown on the Drawings or not. If utility conflicts are encountered by the CONTRACTOR during construction, CONTRACTOR shall give sufficient notice to the CITY so that they may make the necessary adjustments. Damage to any utility, which in the opinion of the CITY is caused by carelessness on the part of the CONTRACTOR, shall be repaired at the expense of the CONTRACTOR.

1.19 GUARANTEE

A. The CONTRACTOR shall guarantee the equipment, material and labor performed under the Contract against any and all failures in proper use and operation for a period of one (1) year from date of written acceptance by the CITY.

B. The CONTRACTOR shall also obtain warranties from manufacturers for each piece of equipment furnished so that the manufacturer's warranty fully covers the equipment for a period of one (1) year from the date of written acceptance by the CITY, unless otherwise specified in the specifications.

1.20 PERFORMANCE OF WORK

A. The CONTRACTOR shall provide all personnel and equipment required to complete all work specified herein and on the Drawings. In an emergency situation, if the CITY determines that it must provide staff and/or equipment to assist the CONTRACTOR in the satisfactory performance of the Contract terms and conditions, the CONTRACTOR at the applicable prevailing wage rates shall reimburse the CITY.

B. CONTRACTOR shall provide forty-eight (48) hours advance written notice to the CITY for approval of CONTRACTOR'S intention to work overtime on weekdays or to work on the weekends.

1.21 BARRICADING (SAFETY)

A. The CONTRACTOR shall be responsible for the furnishing and maintaining of all required barricades, either the lighted or the reflector type, to ensure the public's safety during open trench work or for any other potentially unsafe or hazardous construction activities. Barricades shall be located and displayed in conformance with the most stringent regulations required by the governing agencies. All costs for barricading, including any permits, shall be the responsibility of the CONTRACTOR.

B. All work in public rights-of-way and on private property shall be done in strict compliance with these specifications and Florida Department of Transportation Minimum Standards. Failure to so comply will result in cessation of operations and

the removal of project related obstructions from the right-of-way until compliance is achieved.

1.22 EMERGENCY ACCESS AND SECURITY

A. In order to provide protection to the workers and residents, the CONTRACTOR shall maintain emergency access to the property at all times during construction. These access ways shall be protected and delineated with lighted barricades or other such devices as approved by the regulatory agency. Both ends of the emergency access way shall be blocked in accordance with the MOT permit approved by the CITY with signage indicating that this access way is to be used by emergency vehicles only.

B. No trenches or holes shall be left open after working hours. In the event a trench must be left open after hours, it shall be done so only with the express written permission from the ENGINEER, and it shall be the CONTRACTOR'S responsibility to provide proper protection of the open trench or hole as required by the regulatory agency. In addition, the CONTRACTOR shall provide a security guard at the site whenever the CONTRACTOR'S personnel are not present, 24 hours per day/ 7 days per week. It shall be the Security Guard's responsibility to protect the open trench or hole from trespassers and to direct emergency personnel on site. The Security Guard shall not have any other responsibilities such as operating pumps or equipment but shall be dedicated to protecting the trench or open hole. The Security Guard shall be equipped with a wireless telephone capable of calling 911 to report an emergency and shall keep that telephone on their person at all times. In addition to this provision the CONTRACTOR shall maintain trench safety and comply with current OSHA regulations and the Trench Safety Act. The CONTRACTOR shall maintain and keep all safety barricades, signage, flashers, and detours, in operating condition. A copy of the approved MOT plans, and details, shall be on site at all times.

C. All roads are to be maintained during the described construction as to always allow Emergency Access. This item will be paid for under the bid item for Mobilization as named in the Bid Schedule.

1.23 VIBRATORY COMPACTION

A. The use of vibratory compaction equipment shall be limited to a total gross weight of three (3) tons. The use of vibratory equipment shall be limited to compacting backfill of utility trenches and subgrade of paved areas only. If approved in writing by the ENGINEER, larger vibratory compaction equipment may be allowed if operated in a static mode only.

1.24 REPORTING OF DAMAGE CLAIMS

A. The CONTRACTOR shall keep the CITY informed of any damage claims made against the CONTRACTOR during the construction period. All claims for automobile damage, property damage/bodily injury will be reported to the CONTRACT ADMINISTRATOR within 24 hours of receipt of notice. CONTRACTOR will conduct a timely investigation of the claim and determine if they will honor the claim and/or report to their insurance carrier. CONTRACTOR

will advise the City of Fort Lauderdale in writing of their decision/referral to carrier.

**PART 2 PRODUCTS (Not Applicable)**

**PART 3 EXECUTION (Not Applicable)**

**END OF SECTION**

# SECTION 01010 - SUMMARY OF WORK

## PART 1 GENERAL

1.1 SCOPE

A. City: City of Fort Lauderdale

a. City's Representative/Engineer: *Tom Green, Project Manager*, or designated representative.

B. Project Information

a. Project Goal: The project limits for the DC Alexander Park Project occupy 57,795 square feet (approximately 1.23 acres). The planned enhancements create a strong visual and physical connection to the beach and the International Swimming Hall of Fame – Fort Lauderdale Aquatic Center (FLAC) while prioritizing public pedestrian space. The project adds public beach amenities to include restrooms, a playground and a dramatic architectural overlook that expands the brand of Fort Lauderdale design to create a connected and prosperous community.
   - Pedestrian Connectivity- Make pedestrians the priority
   - Gathering Spaces for all ages
   - Streetscape - Enhance the appearance and environment
   - Make the Beach Iconic and Memorable

b. Project Specifics: There are several main components to the project. These components include the following
   - Restroom Building (Lower Level – Street Level)
   - Grand Stair & Bleachers
   - Plaza and Dunescape
   - Radial Walkway
   - Playground
   - Iconic Architectural Overlook (2nd Level – Elevated above Restrooms & Plaza)

c. More specifically these elements are described as follows:

Restroom Building (Lower Level)

A. Intended to create a large, dynamic, and inviting entry to the Atlantic Ocean architectural Overlook – the Grand Stairs serve as the primary entry for public patrons to access the upper-level overlook but also serve as a gathering space for school groups that may visit the International Swimming Hall of Fame or an area for general social gathering and respite.

Grand Stair and Bleachers

B. Intended to create a large, dynamic, and inviting entry to the Atlantic Ocean architectural Overlook – the Grand Stairs serve as the primary entry for public patrons to access the upper-level overlook but also serve as a gathering space for school groups that may visit the International Swimming Hall of Fame or an area for general social gathering and respite.

C. This space is strategically located at the entry corner of Seabreeze and 5th Street which serves to anchor the design complete with DC Alexander Park Monument Signage facing Seabreeze Blvd.

Plaza & Dunescape

A. The plaza and dunescape is designed to enhance the pedestrian connection through the park from the FLAC and the Beach while also balancing drainage infrastructure demands in an environmentally resilient solution.
B. The Plaza has open pedestrian circulation options on all sides while meandering through planting islands reminiscent of natural dunes. These landscape islands also provide shade and opportunities for casual seating.
C. Below the Plaza is Stormwater Infrastructure which also connects the dunes and/or rain gardens that pre-treat storm water before naturally infiltrating to being collected in the primary stormwater system.

Radial Walkway

A. From the plaza space or from Fort Lauderdale Beach Blvd. patrons will be able to access the Architectural overlook on a radiating path that circulates and views the park at minus 5% slope.
B. Strategically designed, this path includes seating locations, includes a secondary overlook to the FLAC and Seabreeze Blvd before culminating at the Architectural Overlook.
C. To promote safety as the topography rises – this walk is curbed and railed where necessary. Scuppers and trench drains are included in the curbing to allow stormwater drainage. Lighting bollards are also included.
D. The interior concave side of the path serves as an access point to primary access point to playground equipment such as a large custom tube/rope playground, embankment slide and climbing rope.
E. The exterior convex side of the path includes retaining walls that transition to the existing grades along the property line to the south and Seabreeze to the West.

Playground

A. The primary goal of the custom playground design is to be inclusive to children of all ages while blurring the age segregation and boundary of the play space within the park.
B. The playground utilized specifically shaped topography to include mound for smaller children that cannot yet climb but allow height and perspective.
C. A large sculptural tube/rope climbing structure has been custom designed to have multiple access or exit points on differing elevations which takes advantage of the park's topographical characteristics.
D. Embedded at largest elevation change is a dual embankment slide and also includes rock climbing hand holds and rope climbing to traverse the hill and return to the slide.

Iconic Architectural Overlook

A. Reminiscent of sea waves the architectural overlook is designed to give patrons a unique perspective of the Atlantic Ocean to the east that can only be replicated by hotel guests or tourists along Fort Lauderdale Beach Blvd with access to high rises.
B. This feature artfully and tastefully floats or cantilevers overs the Dunescape Plaza with a demanding presence as seen from Fort Lauderdale Beach Blvd and the Beach beyond which is sure to promote an iconic moment of Fort Lauderdale Architecture.
C. Includes a custom steel shade structure above, window openings through the walkway to the plaza below and louvers which block or filter light for sea turtle protection.
D. Includes seating areas along the overlook and looking due east to the Atlantic Ocean beyond.

In addition to the above, as part of the improvements there will be a number of utility relocations such as FPL (Florida Power and Light) undergrounding, abandonments and improvements

1.2 NOTICE TO BIDDERS

A. The successful bidder, in order to be considered responsive, must possess the appropriate License as described in the Contract Documents.

B. It should also be noted that the successful bidder will, at the time of the pre-construction conference, be required to show that each of the CONTRACTOR'S subcontractors is in compliance with the City's Code of Ordinances.

1.3 SITE INVESTIGATION

A. The CONTRACTOR, by virtue of signing the Contract, acknowledges that CONTRACTOR and all subcontractors have satisfied themselves to the nature and location of the work, the general and local conditions including, but not restricted to: those bearing upon transportation; disposal, handling and storage of materials; access roads to the site; the conformation and conditions of the work area; and the character of equipment and facilities needed preliminary to and during the performance of the work. Failure on the part of the CONTRACTOR to completely or properly evaluate the site conditions shall not be grounds for additional compensation.

B. Soil boring information will not be furnished to the CONTRACTOR. The CONTRACTOR, by virtue of signing the Contract, acknowledges that CONTRACTOR and subcontractors have satisfied themselves as to the nature and extent of soil and (underground) water conditions on the project site. No additional payment will be made to the CONTRACTOR because of differences between actual conditions and those shown by the boring logs.

1.4 WORK BY OTHERS

A. Concurrent Work by Other CONTRACTORS. The CONTRACTOR'S attention is directed to the fact that other CONTRACTORS may conduct work at the site during the performance of the WORK under this Contract. The CONTRACTOR shall conduct its operations so as to cause little or no delay to WORK of such other CONTRACTORS, and shall cooperate fully with such CONTRACTORS to provide continued safe access to their respective portions of the site, as required to perform work under their respective contracts.

B. Interference with Work on Utilities. The CONTRACTOR shall cooperate fully with all utility forces of the OWNER or forces of other public or private agencies engaged in the relocation, altering, or otherwise rearranging of any facilities which interfere with the progress of the WORK, and shall schedule the WORK so as to minimize interference with said relocation, altering, or other rearranging of facilities.

1.5 WORK SEQUENCE

A. The CONTRACTOR shall schedule and perform the work in such a manner as

to result in the least possible disruption to the public's use of the parking and park facilities, roadways, driveways, and utilities. Utilities shall include but not be limited to water, sewerage, drainage structures, ditches and canals, gas, electric, television and telephone. Prior to commencing with the WORK, CONTRACTOR shall perform a location investigation of existing underground utilities and facilities in accordance with Section 01530 entitled "Protection of Existing Facilities" and shall have obtained all required permits and permissions, CONTRACTOR shall also deliver written notice to the CITY, ENGINEER, and property occupants (private and public) of all planned disruption to roadway, driveways, temporary displacement of fences, mailboxes, street signs and traffic signs, and utilities 72 hours in advance of disruption.

1.6 WORK SCHEDULE

A. Time is of the essence in completing this project. Because time is of the essence the CONTRACTOR shall commit the necessary resources to this project to complete it in a timely manner. Those resources may include multiple working crews, working overtime, etc. Because time is of the essence, the CONTRACTOR'S construction progress will be monitored closely on a weekly basis. The Construction progress will be measured with the construction schedule submitted by the CONTRACTOR. If the ENGINEER determines that the CONTRACTOR does not meet the Critical Path Method (CPM) as specified in Section 01311, the CONTRACTOR will be required to commit those resources necessary to ensure the completion of the project in a timely manner including working overtime, adding other work crews, etc. All costs incurred to implement measure to complete the work in timely manner will be borne by the CONTRACTOR at no additional cost to the OWNER.

B. REQUIRED PERIODS OF WORK SUSPENSION

a. CONTRACTOR shall shut down operations for all City Holidays, terminating production work by noon on the day preceding the holiday (or the weekend before said holiday) and not resuming operations until the start of the following week (or the day after the holiday, whichever is later). The CONTRACTOR shall ensure that the site is restored per Sections 01001 and 01010 and all areas that are off limits to the public will be clearly delineated and protected. For a full list of holidays, please refer to the City; however these include, but are not limited to New Year's Eve and Day, Martin Luther King's Birthday, Memorial Day, the 4$^{4th}$ of July, Labor Day, Thanksgiving Day and the day after Thanksgiving Day, Christmas Eve and Christmas.

b. The CONTRACTOR shall include these provisions in the schedule required in 01311 and there shall be no additional time granted for these work suspensions.

c. No additional compensation shall be granted for demobilization, cleaning and remobilization as a result of these work suspensions.

d. During the work suspensions, the CONTRACTOR shall remain liable

for the safety and security of the project site and be available 24 hours per the Contract Documents. CONTRACTOR shall have personnel visit the site daily during these suspensions to ensure the safety and security of the site.

C. SCHEDULE

a. CONTRACTOR shall submit scheduling information for the work as required in Section 01311 "Construction Progress Documentation".

b. No separate payment shall be made for preparation and/or revision of the schedule.

D. On-Site Work Hours: Work hours shall be defined at the pre-construction meeting and shall comply with all permit conditions. Except otherwise indicated, work shall be performed during normal business working hours of 7:30 a.m. to 4:00 p.m., Monday through Friday.

1.7 COMPUTATION OF CONTRACT TIME

A. It is the CONTRACTOR'S responsibility to provide clear and convincing documentation to the ENGINEER as to the effect additional work will have with respect to additional contract time extension that may be justified. If additional quantities of work can be carried out concurrent with other existing construction activities without disrupting the critical path of the project then no contract time extension will be granted. The CONTRACTOR is obligated to provide documentation to the ENGINEER if additional elements of work affect the critical path of the project. If work set forth in the original scope of the project is deleted, the contract time may be reduced. This contract is a calendar day contract. While the CONTRACTOR may be granted time to suspend work operations for vacations or holidays, contract time will not be suspended. During suspensions, the CONTRACTOR shall be responsible for all maintenance of traffic and liability without additional compensation from the CITY.

1.8 CONTRACTOR USE OF PREMISES

A. The CONTRACTOR's use of the project site shall be limited to its construction operations. The CONTRACTOR will arrange for storage of materials and a copy of an agreement for use of other property shall be furnished to the ENGINEER.

1.9 PRE-CONSTRUCTION CONFERENCE

A. After the award of Contract, a Pre-construction Work Conference will be held between the CONTRACTOR, the ENGINEER, the CITY, other interested Agencies, representatives of Utility Companies and others affected by the work. The ENGINEER will set the time and place of this conference. The CONTRACTOR shall bring to the conference a copy of the proposed work schedule for the approval by the ENGINEER of the proposed methods and manner of executing the work including sequences of operation and time schedule. The work shall be performed in accordance with such schedule or approved amendments thereto.

## 1.10 UTILITY LOCATIONS

A. As far as possible, all existing utility lines in the project area have been shown on the plans. However, the CITY does not guarantee that all lines are shown, or that said lines are in their true location. It shall be the CONTRACTOR'S responsibility to identify and locate all underground or overhead utility lines or equipment affected by the project. No additional payment will be made to the CONTRACTOR because of discrepancies in actual and plan location of utilities and damages suffered as a result thereof.

B. The CONTRACTOR shall notify each utility company involved at least thirty (30) days prior to the start of construction to arrange for positive underground location, relocation or support of its utility where that utility may be in conflict with or endangered by the proposed construction. The CONTRACTOR shall pay for relocation of water mains or other utilities for the convenience of the CONTRACTOR. The CONTRACTOR shall pay for all charges by utility companies for temporary support of its utilities. All costs of permanent utility relocations to avoid conflict shall be the responsibility of the CONTRACTOR and the utility company involved.

C. The CONTRACTOR shall schedule and coordinate their work in such a manner that they are not delayed by the utility companies relocating or supporting their utilities. No compensation will be paid to the CONTRACTOR for any loss of time or delay.

D. All overhead, surface, and underground structures and/or utilities encountered are to be carefully protected from damage or displacement. All damage to said structures and/or utilities is to be completely repaired within a reasonable time; needless delay will not be tolerated. The CITY reserves the right to remedy any damage by ordering outside parties to make repairs at the expense of the CONTRACTOR. All repairs made by the CONTRACTOR are to be made to the satisfaction of the utility owner and shall be inspected by a representative of the utility owner and the ENGINEER.

E. The CONTRACTOR should be aware of the Sunshine State One Call Center, which has a free locating service for CONTRACTORS and excavators. Within forty-eight hours before excavating, dial toll free 1-800-432-4770, and a locator will be dispatched to the work location. CONTRACTOR shall reasonably notify other utility companies not notified by Sunshine State One Call Center.

F. The permits listed below will be obtained for the project by the CITY prior to beginning construction. The CONTRACTOR is responsible for compliance with any and all permit conditions. In the event that the CITY must obtain permits in addition to those listed below, the CONTRACTOR shall not have any claim for damages arising from any delay caused by the CITY'S obtaining said additional permits.

| | | | |
|---|---|---|---|
| a. | FDOT | : | Construction Agreement / Landscape Permit |
| b. | FDEP | : | Coastal Construction Control Line Permit |

G. Permits to be obtained by the CONTRACTOR include, but are not limited to the following:

a. Local, County, and State contracting licenses.
b. BCEPGMD: Dewatering permit, including NPDES permit if required.
c. MOT from FDOT for SR A1A

1.11 LINE AND GRADE

A. The ENGINEER has provided vertical and horizontal control for layout of the work in the form of benchmarks and reference points located adjacent to the work. From these controls provided, the CONTRACTOR shall develop and make all detailed surveys needed for construction as-built purposes and shall establish all working points, lines and elevations necessary to perform the work. A Professional Land Surveyor registered in the State of Florida shall supervise this surveying work.

1.12 PROTECTION AND RESTORATION OF SURVEY MONUMENTS

A. The CONTRACTOR shall carefully protect from disturbance all survey monuments, stakes and bench marks, whether or not established by CONTRACTOR, and shall not remove or destroy any surveying point until it has been properly witnessed by the ENGINEER. All major survey monuments that have been damaged by the CONTRACTOR such as section corners, 1/4 section corners; property corners or block control points shall be replaced at the CONTRACTOR'S expense with markers of a size and type approved by the ENGINEER. The replacement shall be under the supervision of a Florida Registered Land Surveyor where directed by the ENGINEER.

1.13 EQUIPMENT

A. All equipment necessary and required for the proper construction of all facilities shall be on the construction site, in first-class working condition.

1.14 STORAGE SITES

A. The CONTRACTOR shall furnish, at CONTRACTOR’s expense, properly zoned areas suitable for field office, material storage and equipment service and storage. No material may be stored in the public right of way without prior authorization by the agency having jurisdiction. The CONTRACTOR shall keep these areas in a clean and orderly condition so as not to cause a nuisance or sight obstruction to motorists or pedestrians.

1.15 OWNERSHIP OF EXISTING MATERIALS

A. All materials removed or excavated from the job site shall remain the property of the CITY until released by the Contract Administrator, at which time it shall become the property of the CONTRACTOR, who shall dispose of it in a manner satisfactory to the ENGINEER.

## 1.16 EXCESS MATERIAL

A. Upon direction of the ENGINEER, all vegetation, debris, concrete or other unsuitable materials shall be disposed of in areas provided by the CONTRACTOR and approved by the ENGINEER. Any excess material desired to be retained by the CITY shall be delivered by the CONTRACTOR to a designated area within a 5-mile radius of the project, at no extra cost to the CITY.

## 1.17 AUDIO-VISUAL PRECONSTRUCTION RECORD

A. General

a. Prior to beginning the work, the CONTRACTOR shall have a continuous color audio-video recording taken along the entire length of the project to serve as a record of preconstruction conditions. No construction shall begin prior to review and approval of the video covering the construction area by the ENGINEER. The ENGINEER shall have the authority to reject all or any portion of the videos not conforming to the specifications and order that it be redone at no additional charge. The CONTRACTOR shall reschedule unacceptable coverage within five days after being notified. The ENGINEER shall designate those areas, if any, to be omitted from or added to the audio-video coverage.

## 1.18 ENVIRONMENTAL PROTECTION

A. The CONTRACTOR shall furnish all labor and equipment and perform all work required for the prevention of environmental pollution during and as a result of the work under this contract. For the purpose of this contract, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life, affect other species of importance to man, or degrade the utility of the environment for aesthetic and recreational purposes. The control of environmental pollution requires consideration of air, water, land and involves noise, solid waste management and management of radiant energy and radioactive materials, as well as other pollutants. Environmental pollution prevention shall be in accordance with NPDES requirements with no additional cost to the CITY.

## 1.19 MAINTENANCE AND PROTECTION OF TRAFFIC

A. The CONTRACTOR shall provide all necessary traffic control devices in order to redirect, protect, warn or maintain existing vehicular and pedestrian traffic during the course of construction.

a. Construction Phasing Requirements

i. Contractor shall arrange the schedule to maintain minimum of 11’ travel lane for each direction at all time.

B. TRAFFIC CONTROL

a. The CONTRACTOR is required to submit a conceptual Traffic Control Plan at the Pre-Construction Conference. This preliminary plan should identify the phases of construction that the CONTRACTOR plans to proceed with and identify traffic flows during each phase. The ENGINEER will have ten (10) days to notify the CONTRACTOR of any comments. Once the conceptual plan for maintaining traffic has been approved, the CONTRACTOR will be required to submit a detailed plan showing each phase's Maintenance and Protection Plan prior to starting construction of any phase.

b. The "Maintenance of Traffic" plan shall include pedestrian traffic as well as vehicular traffic. It shall be the responsibility of the CONTRACTOR for any necessary Construction, Pavement Marking and Signage or any Pedestrian Signalization and/or Signal Modification to accommodate an alternate safe walk route.

c. The CONTRACTOR, at all times, shall conduct the work in such a manner as to insure the least obstruction to traffic as is practical. Convenience of the general public and of the residents adjacent to the work shall be provided for in a satisfactory manner, as determined by the ENGINEER.

d. Sidewalks, gutters, drains, fire hydrants and private drives shall, insofar as practical, be kept in condition for their intended uses. Fire hydrants on or adjacent to the work shall be kept accessible to fire apparatus at all times, and no material or obstruction shall be placed within twenty (20) feet of any such hydrant.

e. All existing stop and street name signs will be maintained as long as deemed necessary by the ENGINEER.

f. The CONTRACTOR shall furnish a sufficient number of protective devices to protect and divert the vehicular and pedestrian traffic from working areas closed to traffic, or to protect any new work. Failure to comply with this requirement will result in the ENGINEER shutting down the work until the CONTRACTOR provides the necessary protection.

g. Any time traffic is diverted for a period of time that will exceed one-work day temporary pavement markings will be required. Existing pavement markings that conflict with the new work zone traffic pattern must be obliterated. Painting over existing pavement markings (black out) is not permitted.

1.20 MAINTENANCE AND PROTECTION OF EXISTING DRAINAGE SYSTEM

A. It shall be the responsibility of the contractor to maintain positive drainage on the surface and to ensure that the existing underground drainage system continues to function as intended during the construction. The contractor shall

follow the plans to ensure that existing catch basins and manholes are being protected during the entire phase of construction.

1.21 APPLICATION FOR PAYMENT FOR STORED MATERIALS

A. Application for payment for stored materials may not be made by the CONTRACTOR.

1.22 SPECIAL CONDITIONS FOR CONSTRUCTION BY OTHER AGENCIES

A. It will be the CONTRACTOR'S responsibility to coordinate construction schedules with other contractors so as to minimize disruptions, and inconveniences. The project site shall be safe at all times for construction workers and marina visitors.

**PART 2 PRODUCTS (Not Applicable)**

**PART 3 EXECUTION (Not Applicable)**

**END OF SECTION**

# SECTION 01025 - MEASUREMENT AND PAYMENT

## PART 1 GENERAL

1.1 SUBMITTALS

A. See Section 01340, Submittal Procedures, and all other references to document submittals. Submittals shall include, but are not limited to:

a. Schedule of Values: Submit schedule on OWNER's form.

b. Application for Payment.

c. Final Application for Payment.

1.2 SCHEDULE OF VALUES

A. Prepare a schedule of values for the Work.

B. Unit Price Work: Reflect unit price quantity and price breakdown from conformed Bid Form.

C. Lump Sum Work:

1. Reflect schedule of values format included in conformed Bid Form.

2. List Bonds and insurance premiums, mobilization, demobilization, facility startup, and contract closeout separately.

3. Break down by Divisions 2 through 16 with appropriate subdivision of each Specification.

D. An unbalanced or front-end loaded schedule will not be acceptable.

E. Summation of the complete schedule of values representing all the Work shall equal the Contract Price.

1.3 APPLICATION FOR PAYMENT

A. Transmittal Summary Form: Attach one Summary Form with each detailed Application for Payment and include Request for Payment of Materials and Equipment on Hand as applicable. Execute certification by authorized officer of CONTRACTOR.

B. Use detailed Application for Payment Form provided by OWNER.

C. Include accepted schedule of values for each portion of Work and the unit price breakdown for the Work to be paid on unit price basis, and a listing of

OWNER- selected equipment, if applicable, and allowances, as appropriate.

D. Preparation:

a. Round values to nearest dollar.

b. List each Change Order and Written Amendment executed prior to date of submission as separate line item. Totals to equal those shown on the Transmittal Summary Form.

c. Submit Application for Payment, including a Transmittal Summary Form and detailed Application for Payment Form, a listing of materials on hand as applicable, and such supporting data as may be requested by OWNER.

1.4 MEASUREMENT - GENERAL

A. Weighing, measuring, and metering devices used to measure quantity of materials for Work shall be suitable for purpose intended and conform to tolerances and Specifications as specified in National Institute of Standards and Technology, Handbook 44.

B. Whenever pay quantities of material are determined by weight, material shall be weighed on scales furnished by CONTRACTOR and certified accurate by state agency responsible. Weight or load slip shall be obtained from weigher and delivered to CONTRACTOR or OWNER's representative at point of delivery of material.

C. If material is shipped by rail, car weights will be accepted provided that actual weight of material only will be paid for and not minimum car weight used for assessing freight tariff, and provided further that car weights will not be acceptable for material to be passed through mixing plants.

D. Vehicles used to haul material being paid for by weight shall be weighed empty daily and at such additional times as required by CONTRACTOR. Each vehicle shall bear a plainly legible identification mark.

E. Materials that are specified for measurement by the cubic yard measured in the vehicle shall be hauled in vehicles of such type and size that actual contents may be readily and accurately determined. Unless all vehicles are of uniform capacity, each vehicle must bear a plainly legible identification mark indicating its water level capacity. Vehicles shall be loaded to at least their water level capacity. Loads hauled in vehicles not meeting above requirements or loads of a quantity less than the capacity of the vehicle, measured after being leveled off as above provided, will be subject to rejection, and no compensation will be allowed for such material.

F. Where measurement of quantities depends on elevation of existing ground, elevations obtained during construction will be compared with those shown on Drawings. Variations of 1 foot or less will be ignored, and profiles shown on Drawings will be used for determining quantities.

G. Units of measure shown on Bid Form shall be as follows, unless specified otherwise. All methods of measurement shall be approved by the CONTRACTOR.

| Item | Method of Measurement |
|---|---|
| AC | Acre - Field Measure |
| CY | Cubic Yard - Field Measure within limits specified or shown, or measured in vehicle by volume, as specified |
| EA | Each - Field Count |
| GAL | Gallon - Field Measure |
| HR | Hour |
| LB | Pound(s) - Weight Measure by Scale |
| LF | Linear Foot - Field Measure |
| LS | Lump Sum - Unit is one; no measurement will be made |
| SF | Square Foot |
| SY | Square Yard |
| TON | Ton - Weight Measure by Scale (2,000 pounds) |

1.5 PAYMENT

A. General:

a. Progress payments will be made monthly.

b. The date for CONTRACTOR's submission of monthly Application for Payment.

1.6 NONPAYMENT FOR REJECTED OR UNUSED PRODUCTS

A. Payment will not be made for following:

a. Loading, hauling, and disposing of rejected or unused material.

b. Quantities of material wasted or disposed of in manner not called for under Contract Documents.

c. Rejected loads of material, including material rejected after it has been placed by reason of failure of CONTRACTOR to conform to provisions of Contract Documents.

d. Material not unloaded from transporting vehicle.

e. Defective Work not accepted by OWNER.

f. Material remaining on hand after completion of Work.

1.7 MOBILIZATION

A. See Section 01505, Mobilization, for payment limitations. All environmental

compliance matters except for erosion control system shall be included in Mobilization.

B. Payment for mobilization will be made at an allowance price named in the Bid Schedule. Payment for mobilization will be made in equal monthly amounts during the duration of the original contract time.

1.8 MAINTENANCE OF TRAFFIC (M.O.T.)

A. See Section 01570, Traffic Regulations, and all other references to traffic control and maintenance, as well as parking control and maintenance in this document and any regulatory requirements.

B. Payment for maintenance of traffic will be made at an allowance price named in the Bid Schedule. Payment for maintenance of traffic and parking activities will be made in equal monthly amounts during the duration of the original contract time.

1.9 HARDSCAPE DEMOLITION

A. Measurement for payment to remove and dispose of existing hardscape elements will be based on a lump sum inclusive of all work on the Demolition drawings.

B. This lump sum for removal and disposal of existing hardscape elements as indicated on the Design Drawings shall constitute full compensation for the removal and disposal of all concrete, asphalt or structures. This includes, but is not limited to sidewalks, curbs, aprons, concrete collars, brick pavers, and all other miscellaneous concrete as directed by the ENGINEER. Existing structures will not be compensated under this line item.

1.10 PAVING AND DRAINAGE

A. Measurement for payment to furnish and install drainage structures, inlets or top slabs, connections, and paving in addition to all required connections, modifications and cleaning of drainage facilities will be based on the line items provided for each item of work for all work to be performed on the applicable drawings, all in accordance with the requirements of the Contract Documents.

B. Payment for furnishing and installing, modifying or cleaning all drainage appurtenances in the design drawings which price shall constitute full compensation for the completed installation of the structure including but not limited to excavation, backfill, compaction, modifications, disposal, cleaning, all required dewatering and full compliance with the Trench Safety Act.

1.11 WATER AND SEWER

A. Measurement for payment to furnish and install all water and sewer items will be lump sum for all work to be performed on the applicable drawings, all in accordance with the requirements of the Contract Documents.

B. Payment for furnishing and installing all water and sewer items shall constitute

full compensation for the completed installation of the structure including but not limited to excavation, backfill, compaction, modifications, disposal, cleaning, all required dewatering and full compliance with the Trench Safety Act.

1.12 STRUCTURES

A. Measurement for payment to furnish and install all shade structures and other structures, will be lump sum for all work to be performed on the applicable drawings, all in accordance with the requirements of the Contract Documents.

B. Payment for furnishing and installing shade structures and other structures shall constitute full compensation for the completed installation of the structure including but not limited to excavation, dewatering, backfill, compaction, modifications, disposal and cleaning.

1.13 AMENITIES

A. Measurement for payment to furnish and install all amenities will be lump sum for all work to be performed on the applicable drawings, all in accordance with the requirements of the Contract Documents.

B. Payment for furnishing and installing all amenities shall constitute full compensation for the completed installation of the structure including but not limited to excavation, dewatering, backfill, compaction, modifications, disposal and cleaning.

1.14 LANDSCAPING

A. Measurement for payment to furnish and install trees, sod, groundcover and irrigations will be lump sum for all work to be performed on the applicable drawings, all in accordance with the requirements of the Contract Documents.

B. Payment for furnishing and installing all trees, sod, groundcover and irrigations, shall constitute full compensation for the completed installation of the structure including but not limited to excavation, dewatering, backfill, compaction, modifications, disposal and cleaning.

1.15 ELECTRICAL

A. Measurement for payment to furnish and install all electrical equipment and conduits will be lump sum for all work to be performed on the applicable drawings, all in accordance with the requirements of the Contract Documents.

B. Payment for furnishing and installing all electrical equipment and conduits shall constitute full compensation for the completed installation of the structure including but not limited to excavation, dewatering, backfill, compaction, modifications, disposal and cleaning.

1.16 PERMIT FEES

A. Measurement for payment for permit fees will be based upon the actual permit fees required by the CONTRACTOR from the various agencies having jurisdiction for construction of the project, all in accordance with the Contract Documents. The allowance for permit fee amounts shown on the bid schedule is an estimate of permit fees required for the project and is a cost pass through item. The permit fees are based on allowances and OWNER will reconcile the actual cost with the CONTRACTOR by change order. The CONTRACTOR shall produce documentation upon request verifying actual cost. Only permit fees substantiated and approved by the ENGINEER will be paid as part of this bid item.

B. Because payment for permit fees will be paid as part of this bid item, payment for permit fees will not be paid as part of mobilization.

1.17 CONSIDERATION FOR INDEMNIFICATION (OWNER/ENGINEER)

A. Measurement for payment for indemnification of the OWNER and ENGINEER will be based upon the sum named for such work, all in accordance with the requirements of the contract documents.

B. Payment will be twenty-five dollars for consideration for indemnification named in the bid schedule and shall constitute full compensation for indemnifying the OWNER and ENGINEER as specified in the contract documents.

1.18 ALLOWANCE FOR FPL/COMCAST/AT&T

A. Not applicable for this project.

**PART 2 PRODUCTS (NOT APPLICABLE)**

**PART 3 EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

# SECTION 01031 – ALTERATION PROJECT PROCEDURES

## PART 1 GENERAL

### 1.1 REQUIREMENTS

A. Coordinate work of trades and schedule elements of alterations and renovation work by procedure and methods to expedite completion of the work.

B. In addition to demolition and that specifically shown, cut, move or remove items necessary to provide access or to allow alterations and new work to proceed. Include such items as:

a. Repair or removal of hazardous or unsanitary conditions.

b. Removal of abandoned items and items serving no useful purpose, such as abandoned piping, conduit and wiring.

c. Removal of unsuitable or extraneous materials not marked for salvage, such as abandoned furnishings and equipment, and debris such as rotted wood, rusted metals and deteriorated concrete, shall be removed from the site expeditiously.

d. Cleaning of surfaces and removal of surface finished as needed to install new work and finishes.

e. Protection as required for existing trees to remain.

f. For purposes of all existing underground utilities work, coordinate as required by use of special telephone number shown on engineering drawings.

g. Site storage for all existing benches, signals, signs, light poles, fire hydrants, manhole covers and grates to be relocated.

C. Patch, repair and refinish existing items to remain, to the specified condition for each material, with a professional transition to adjacent new items of construction.

### 1.2 RELATED REQUIREMENTS

A. All applicable sections of the Specifications.

B. Conditions of the Contract.

### 1.3 ALTERATIONS, CUTTING AND PROTECTION

A. Assign the work of moving, removal, cutting, patching and protection to trades qualified to perform the work in a manner to cause least damage to each type of work, and provide means of returning surfaces to appearance of new work.

B. Perform cutting and removal work to remove minimum necessary, and in a manner to avoid damage to adjacent work.

a. Cut finish surfaces such as paving, masonry, tile, plaster or metals, by methods to terminate surfaces in a straight line at a natural point of division.

C. Perform cutting and patching as specified in Section 01045.

D. Protect existing finishes, equipment, and adjacent work which are scheduled to remain, from damage.

a. Protect existing and new work from weather and extremes of temperature.

## PART 2 PRODUCTS

2.1 PRODUCTS FOR PATCHING, EXTENDING AND MATCHING

A. General Requirements that work be complete:

a. Provide same products or types of construction as that in existing structure, as needed to patch, extend or match existing work.

i. Generally Contract Documents will not define products or standards of working conduct present in existing construction; CONTRACTOR shall determine products in inspection and any necessary testing by use of the existing as a sample of comparison.

b. Presence of a product, finish, or type of construction, requires that patching, extending or matching shall be performed as necessary to make work complete and consistent to existing identical standards of quality.

## PART 3 EXECUTION

3.1 PERFORMANCE

A. Patch and extend existing work using skilled mechanics who are capable of matching existing quality. Quality of patched or extended work shall be not less than that specified for new work.

3.2 DAMAGED SURFACES

A. Patch and replace any portion of an existing finished surface with the exception of concrete curb or gutter which is found to be damaged, lifted, discolored, or shows other imperfections. Damaged curbing shall be replaced in sections as directed by the engineer.

a. Provide adequate support of substrate prior to patching the finish.
b. Refinish patched portions of painted or coated surfaces in a manner to produce uniform color and texture over entire surface.

c. When existing surface finish cannot be matched, refinish entire surface to nearest intersections.

3.3 TRANSITION FROM EXISTING TO NEW WORK

A. When new work abuts or is finished flush with existing work, make a smooth transition. Patched work shall match existing adjacent work in texture and appearance so that the patch of transition is invisible at a distance of five feet.

a. When finished surfaces are cut in such a way that a smooth transition with new work is not possible, terminate existing surface in a neat manner along a straight line at a natural line of division, and provide trim appropriate to finished surface.

3.4 CLEANING

A. Perform periodic and final cleaning as specified in Section 01710.

a. Clean OWNER occupied areas daily.

b. Clean spillage, overspray, and heavy collection of dust in OWNER occupied areas immediately.

B. At completion of work of each trade, clean area and make surfaces ready for work of successive trades.

C. At completion of alterations work in each area, provide final cleaning and return space to a condition suitable for use by OWNER.

3.5 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work in this section. Payment for work shall be included in all other work.

**END OF SECTION**

# SECTION 01040 - COORDINATION

## PART 1 GENERAL

1.1 SUBMITTALS

A. Informational

a. Statement of Qualification (SOQ) for land surveyor or civil engineer.

b. Statement of Qualification (SOQ) for professional videographer.

B. Photographs

a. Color Prints

i. Submit two copies within 5 days of being taken.

b. Video Recordings

i. Submit two copies within 5 days of being taken.

1.2 UTILITY NOTIFICATION AND COORDINATION

A. Coordinate the Work with various utilities within Project limits. Notify applicable utilities prior to commencing Work.

B. Contact the City of Fort Lauderdale Public Services Department at 954-828-8000 for water and sewer utility locations.

C. Contact Sunshine State One Call at 1-800-432-4770 at least 2 business days prior to any excavation.

D. If damage occurs, or if conflicts or emergencies arise during Work, contact the appropriate utility.

a. Electricity Company: Florida Power and Light.
- Contact Person: Byron Sample (or police/fire – 911).
- Telephone: 954-321-2056

b. Telephone Company: AT&T Distribution
- Contact Person: Otis Keeve
- Telephone: 954-723-2540

c. Water and Sewer Department: Fort Lauderdale Public Services Department.
- Contact Person: Emergency Hotline.
- Telephone: 954-828-8000.

d. Gas Company: TECO Peoples Gas.

- Contact Person: David Rivera
- Telephone: 954-453-0749

e. Telecom: Comcast.
- Contact: John Matonti
- Telephone: 954-447-8486.

f. Telecom: Hotwire
- Contact: Walter Sancho-Davila
- Telephone: 954.699.0900

g. Broward County Traffic Engineering Division (For Traffic Signal Communications Systems Underground Cable and Traffic Loops):
- Contact: Robert Blount.
- Telephone: 954-847-2745.

1.3 PROJECT MEETINGS

A. General

a. Contract: Schedule physical arrangements for meetings throughout progress of Work, prepare meeting agenda with City and Contractor input and distribute with written notice of each meeting, preside at meetings, record minutes to include significant proceedings and decisions, and reproduce and distribute copies minutes after each meeting to participants and parties affected by meeting decisions.

b. Representatives of City, Contractor, and Subcontractors shall attend meetings as needed.

B. Preconstruction Conference

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

i. Required schedules.

ii. Status of Bonds and insurance.

iii. Sequence of critical path work items.

iv. Project changes and clarification procedures.

v. Use of site, access, office and storage areas, security and temporary facilities.

vi. Major project delivery and priorities.

vii. Contractor's safety plan and representative.

viii. Progress payment procedures.

ii. Attendees may include but not limited to:

i. City's representatives

ii. Contractor's office representative

iii. Contractor's resident superintendent

iv. Contractor's quality control representative

v. Subcontractor's representatives whom Contractor may desire or City may request to attend.

vi. Engineer's representatives.

vii. Others as appropriate.

c. Preliminary Schedules Acceptability Review Meeting: As required to review and finalize Preliminary Schedule.

C. Progress Meetings

a. Contactor will schedule regular progress meetings at site, conducted weekly to review Work progress, progress schedule, Shop Drawing and Sample submissions schedule, Application for Payment, contract modifications, and other matters needing discussion and resolution.

b. Attendees will include

i. City's representatives, as appropriate.

ii. Contractor, Subcontractors and Suppliers, as appropriate.

iii. Others as appropriate.

c. On a monthly basis, the will conduct a meeting to review work completed the previous month versus the Progress Schedule, work planned for upcoming month based on the Progress Schedule, the monthly Application for Payment, and any outstanding issues related to performance of the Work including pending contract modifications, requests for clarification, Shop Drawings, etc. All parties will attend the monthly meeting.

D. Pre-installation Meetings

a. When required in individual Specification sections or as necessary to coordinate the Work, convene at site prior to commencing Work of that section.

b. Require attendance of entities directly affecting, or affected by, Work of

that section.

c. Notify City/Architect 4 days in advance of meeting date.

d. Provide suggested agenda to City/Architect to include reviewing conditions of installation, preparation and installation or application procedures, and coordination with related Work and work of others.

E. Other Meetings

a. In accordance with the Contract Documents and as may be required by the City and Engineer.

1.4 FACILITY OPERATIONS

A. Continuous operation of City's facilities is of critical importance. Schedule and conduct activities to enable existing facilities to operate continuously, unless otherwise specified.

B. Perform Work continuously during critical connections and changeovers, and as required to prevent interruption of City's operations.

C. When necessary, plan, design, and provide various temporary services, utilities, connections, temporary piping and heating, access, and similar items to maintain continuous operations of City’s facilities.

D. Do not close lines, open or close valves, or take other action which would affect the operation of existing systems, except as specifically required by the Contract Documents and after authorization by City and Engineer. Such authorization will be considered within 48 hours after receipt of Contractor’s written request.

E. Provide **7** days advance written request for approval of need to shut down a process or facility to City/Engineer of Record.

F. Power outages will be considered upon 48 hours written request to City. Describe the reason, anticipated length of time, and areas affected by the outage. Provide temporary provisions for continuous power supply to critical facility components.

G. Do not proceed with Work affecting a facility's operation without obtaining City's advance approval of the need for and duration of such Work.

H. Relocation of Existing Facilities:

a. During construction, it is expected that minor relocations of Work will be necessary.
01230

b. If Contractor determines that in order to expedite construction of new water

and or sewer mains it would be necessary to temporarily remove and replace existing water services and/or sewer service connections, he will be responsible for the removal and replacement of such service connections at his own cost and effort. The City will not provide additional compensation for any costs associated with such effort. All labor and material costs associated with means and methods of construction will be compensated as part of the bid item(s) cost submitted by the Contractor. Additionally, the Contractor will have to coordinate and inform utility owner(s) and any City resident(s) impacted by such activities and must repair such utilities in a timely manner to minimize disruption of service.

c. Provide complete relocation of existing structures and Underground Facilities, including piping, utilities, equipment, structures, electrical conduit wiring, electrical duct bank, traffic loop detectors and other necessary items.

d. Use only new materials for relocated facility. Match materials of existing facility, unless otherwise shown or specified.

e. Perform relocations to minimize downtime of existing facilities.

f. Install new portions of existing facilities in their relocated position prior to removal of existing facilities, unless otherwise accepted by City.

1.5 BYPASS PUMPING

A. Where the Work includes connections or modifications to existing sanitary sewer systems, wastewater flows shall be controlled through the pipeline sections and pump stations where work is being performed. Under no circumstances, can portions of the system be removed from service for periods of time in excess of that approved by the City. The Contractor shall be responsible to assess conditions and capacities of the existing sewer lines and pump stations in order to implement an acceptable bypass plan at no additional cost to the City. Bypass pumping will be required for all sewers and pump station construction that would result in shutdown of existing facilities. The Contractor shall supply the necessary pumps, conduits, and other equipment to not only divert flow around the pump station, manhole, or pipe section in which work is to be performed, but also to transmit the flow in downstream sewer lines and/or pump stations without surcharge. The bypass systems shall be of sufficient capacity to handle existing flows plus additional flows that may occur during periods of high tide or rainfall. Emergency backup pumping capability must be available in addition to the primary bypass system. The Contractor will be responsible for furnishing the necessary labor, power, and supervision to set up and operate the pumping and bypass systems. When pumping is in operation, all engines shall be equipped in a manner to keep the pump noise to a minimum and to comply with applicable noise ordinances.

B. Contractor shall be responsible for any damage to properties or buildings connected to the sewer system, and to the pipeline, which result from the flow control activities.

C. Contractor shall submit a bypass pumping plan for all proposed bypass pumping operations.

1.6 PHYSICAL CONDITIONS

A. Exercise reasonable care to verify locations of existing subsurface structures and underground facilities.

B. Thoroughly check immediate and adjacent areas subject to excavation by visual examination (and by electronic metal and pipe detection equipment, as necessary) for indications of subsurface structures and underground facilities.

C. Make exploratory excavations where existing underground facilities or structures may potentially conflict with proposed underground facilities or structures. Conduct exploratory excavations in presence of Engineer and sufficiently ahead of construction to avoid possible delays to Contractor's Work.

1.7 ADJACENT FACILITIES AND PROPERTIES

A. Examination

a. After Effective Date of the Agreement and before Work at site is started, Contractor, City/Architect, and affected property owners and utility owners shall make a thorough examination of pre-existing conditions including existing buildings, structures, and other improvements in vicinity of Work, as applicable, which could be damaged by construction operations.

b. Periodic reexamination shall be jointly performed to include, but not limited to, cracks in structures, settlement, leakage, and similar conditions.

B. Documentation

a. Record and submit documentation of observations made on examination inspections in accordance with paragraphs Construction Photographs and Audio-Video Recordings.

b. Upon receipt, Engineer will review, sign, and return one record copy of documentation to Contractor to be kept on file in field office.

c. Such documentation shall be used as indisputable evidence in ascertaining whether and to what extent damage occurred as a result of Contractor's operations, and is for the protection of adjacent property owners, Contractor, and City.

1.8 CONSTRUCTION PHOTOGRAPHS

A. Photographically document all unique portions of the construction including tie-ins to existing pipelines or facilities, crossings of existing utilities, buried valve and piping intersections, and other work items that will not otherwise be visible after

completion of construction.

B. Film or file handling and development shall be done by a commercial laboratory.

C. City and Engineer shall have the right to select the subject matter and vantage point from which photographs are to be taken.

D. Construction Progress Photos

a. Photographically demonstrate progress of construction, showing every aspect of site and adjacent properties as well as interior and exterior of new or impacted structures.

b. Monthly: Take 24 exposures digital photographs of comparable quality, unless otherwise approved by the PCM.

## 1.9 AUDIO-VIDEO RECORDINGS

A. Prior to beginning Work on construction site or of a particular area of the Work, and again within 10 days following date of Substantial Completion, videograph construction site and property adjacent to construction site.

B. In the case of preconstruction recording, no Work shall begin in the area prior to City/Contractor review and approval of content and quality of video for that area.

C. Particular emphasis shall be directed to physical condition of existing vegetation, structures, and pavements within pipeline alignment and areas adjacent to and within the right-of-way or easement, and on Contractor storage and staging areas.

D. City, Contractor and Engineer shall have right to select subject matter and vantage point from which videos are to be taken.

E. Videotaping shall be by a professional commercial videographer, experienced in shooting construction videos.

F. Video Format and Quality

a. Video

i. Produce bright, sharp, and clear images with accurate colors, free of distortion and other forms of picture imperfections.

ii. Electronically, and accurately display the month, day, year, and time of day of the recording.

b. Audio

i. Audio documentation shall be done clearly, precisely, and at a

moderate pace.

ii. Indicate date, Project name, and a brief description of the location of taping, including

a. Facility name;

b. Street names or easements;

c. Addresses of private property; and

d. Direction of coverage, including engineering stationing, if applicable.

G. The Following Shall be Included with the Video Documentation

a. Coverage is required within and adjacent to the rights-of-way, easements, storage, and staging areas where the work is being constructed.

b. Documentation of the conditions of the adjacent properties or any affected structures as a result of the impending construction.

c. Certification as to date work done and by whom.

d. All videos shall be keyed to the construction drawings, provided with an index and a written narrative.

H. Preconstruction and Post-Construction Videos Shall be Submitted as follows:

a. Preconstruction videos shall be presented to the City at the preconstruction conference.

b. Post-construction videos shall be submitted prior to final project closeout. This submittal is contingent to final payment.

I. Payment for the work in this Section will be included as part of the lump sum price for mobilization/demobilization.

1.10 REFERENCE POINTS, SURVEYS, AND RECORD DRAWINGS

A. Location and elevation of benchmarks are shown on Drawings.

B. Contractor's Responsibilities:

a. Provide all survey efforts required to layout the Work.

b. Check and establish exact location of existing facilities prior to construction of new facilities and any connections thereto.

c. In event of discrepancy in data or benchmarks, request clarification before proceeding with Work.

d. Retain a professional land surveyor or civil engineer registered in the State of Florida who shall perform or supervise all surveying necessary for construction staking and layout and obtaining record information for as-built and record drawing preparation.

e. Maintain complete accurate log of survey Work as it progresses as a Record Document. The Contractor is responsible for the quality control of horizontal location and vertical elevations of the installed project.

f. On request of City/Engineer of Record, submit documentation.

g. Provide competent employee(s), tools, stakes, and other equipment and materials as City/Engineer of Record may require to:

i. Establish control points, lines, and easement boundaries.

ii. Check layout, survey, and measurement Work performed by others.

iii. Measure quantities for payment purposes.

## PART 2 PRODUCTS (NOT USED)

## PART 3 EXECUTION

3.1 CUTTING, FITTING, AND PATCHING

A. Cut, fit, adjust, or patch Work and work of others, including excavation and backfill as required, to make Work complete.

B. Obtain prior written authorization of Engineer before commencing Work to cut or otherwise alter:

a. Structural or reinforcing steel, structural column or beam, elevated slab, trusses, or other structural member.

b. Weather - or moisture-resistant elements.

c. Efficiency, maintenance, or safety of element.

d. Work of others.

C. Refinish surfaces to provide an even finish.

a. Refinish continuous surfaces to nearest intersection.

b. Refinish entire assemblies.

c. Finish restored surfaces to such planes, shapes, and textures that no transition between existing work and Work is evident in finished surfaces.

i. Restore existing work, Underground Facilities, and surfaces that are to remain in completed Work including concrete-embedded piping, conduit, and other utilities as specified and as shown.

ii. Make restorations with new materials and appropriate methods as specified for new Work of similar nature; if not specified, use recommended practice of manufacturer or appropriate trade association.

**END OF SECTION**

# SECTION 01045 - CUTTING AND PATCHING

## PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

A. CONTRACTOR shall be responsible for all cutting, fitting and patching, including attendant excavation and backfill, required to complete the work or to:

a. Make its several parts fit together properly.

b. Uncover portions of the work to provide for installation of ill-timed work.

c. Remove and replace defective work.

d. Remove and replace work not conforming to requirements of Contract Documents.

e. Remove samples of installed work as specified for testing.

f. Provide routine penetrations of nonstructural surfaces for installation of piping and electrical conduit.

1.2 RELATED REQUIREMENTS

A. All applicable sections of the Specifications.

B. Conditions of the Contract.

1.3 SUBMITTALS

A. Submit a written request to ENGINEER well in advance of executing any cutting or alteration, which affects:

a. Work of the OWNER or any separate CONTRACTOR.

b. Structural value of integrity of any element of the project.

c. Integrity of effectiveness of weather-exposed or moisture-resistant elements or systems.

d. Efficiency, operational life, maintenance or safety of operational elements.

e. Visual qualities of sight-exposed elements.

B. Request shall include:

a. Identification of the project.

b. Description of the affected work.

c. The necessity for cutting, alteration or excavation.

d. Effect on work of OWNER or any separate CONTRACTOR, or on structural or weatherproof integrity of project.

e. Description of proposed work

i. Scope of cutting, patching, alteration, or excavation.

ii. Trades who will execute the work.

iii. Products proposed to be used.

iv. Extent of refinishing to be done.

f. Alternatives to cutting and patching.

g. Cost proposal, when applicable.

h. Written permission of any separate CONTRACTOR whose work will be affected.

C. Should conditions of work or the schedule indicate a change of products from original installation, CONTRACTOR shall submit request for substitution as specified in Section 01600, paragraph 1.08.

D. Submit written notice to ENGINEER designating the date and time the work will be uncovered.

## PART 2 PRODUCTS

2.1 MATERIALS

A. Comply with specifications and standards for each specific product involved.

## PART 3 EXECUTION

3.1 INSPECTION

A. Inspect existing conditions of project, including elements subject to damage or to movement during cutting and patching.

B. After uncovering the work, inspect conditions affecting installation of products, or performance of work.

C. Report unsatisfactory or questionable conditions affecting installation of products, or performance of work.

3.2 PREPARATION

A. Provide adequate temporary support as necessary to assure structural value or integrity of affected portion of work.

B. Provide devices and methods to protect other portions of project from damage.

C. Provide protection from elements for that portion of the project, which may be exposed by cutting and patching, work, and maintain excavations free from water.

3.3 PERFORMANCE

A. Execute cutting and demolition by methods, which will prevent damage to other work, and will provide proper surfaces to receive installation of repairs.

B. Execute excavating and backfilling by methods, which will prevent settlement or damage to other work.

C. Employ original Installer or Fabricator to perform cutting and patching for:

a. Weather-exposed or moisture-resistant elements.

b. Sight-exposed finished surfaces.

D. Execute fitting and adjustment of products to provide a finished installation to comply with specified product, functions, tolerances and finishes.

E. Restore work which has been cut or removed; install new products to provide completed work in accordance with requirements of Contract Documents.

F. Fit work airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.

G. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:

a. For continuous surfaces, refinish to nearest intersection.

b. For an assembly, refinish entire unit.

3.4 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section, it shall be included in the unit price bid of any item requiring cutting and patching, including pavement restoration.

**END OF SECTION**

# SECTION 01050 - PROJECT MANAGEMENT

## PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

a. Coordination Drawings.

b. Special Project Procedures

c. Administrative and supervisory personnel.

d. Project meetings.

e. Requests for Information (RFIs).

B. Related Sections include the following:

a. Section 01200, “Project Meetings”

b. Section 01311, "Construction Progress Documentation"

c. Section 01340, "Submittal Procedures"

d. Section 01780, "Contract Closeout "

1.3 DEFINITIONS

A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.4 COORDINATION

A. Coordination. Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

a. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of

other components, before or after its own installation.

b. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.

c. Make adequate provisions to accommodate items scheduled for later installation.

d. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

B. Memoranda.

a. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

i. Prepare similar memoranda for City and separate contractors if coordination of their Work is required.

C. Administrative Procedures

a. Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

i. Preparation of Contractor's Construction Schedule.

ii. Preparation of the Schedule of Values.

iii. Installation and removal of temporary facilities and controls.

iv. Delivery and processing of submittals.

v. Progress meetings.

vi. Project closeout activities.

1.5 SUBMITTALS

A. Key Personnel Names

a. Within 5 days of notice to proceed, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site including:

i. Identify individuals and their duties and responsibilities; list

addresses and telephone numbers, including home and office telephone numbers.

ii. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1.6 SPECIAL PROJECT PROCEDURES

A. Discrepancies, Errors

a. Should discrepancies or errors appear in the drawings or specifications concerning materials, workmanship, or quantity of work to be performed, the Contractor will be required to immediately notify the City before proceeding with the work.

b. If the Contractor fails to notify the City and proceeds with the work, Contractor will be required to correct the errors at his/her own expense. In the event of a conflict between the drawings and specifications, the City will decide on the way to perform the work or supply the materials.

B. Dimensions and Measurements

a. The figured dimensions on the drawings or notes including dimensions shall be used for construction instead of measurements of the drawings by scale. No scale measurements shall be used as a dimension for construction.

b. Dimensions on all drawings as well as the detail drawings themselves are subject in every case to measurements of adjacent or previously completed work. All such measurements necessary shall be taken before undertaking any work dependent upon such data.

c. Field verification of dimensions on plans is mandatory since actual locations, distances, and levels will be governed by actual field conditions.

C. Discrepancies or Inconsistencies:

a. Should any discrepancy or inconsistency appear between larger and smaller scale drawings in any of the divisions of the specifications or in any of the contract documents, such discrepancy shall be immediately submitted to the City for correction before proceeding with the work in question. In no case shall the Contractor make any alterations, erasures, changes or modifications in the drawings or specifications.

i. Should it appear that any of the work as specified or shown by the drawings is not sufficiently detailed or explained, the Contractor shall apply to the City for such further details or information as may be necessary for full understanding of the work in question.

ii. The data set forth in these specifications and indicated on the drawings are as accurate as can be obtained, but their extreme accuracy is not guaranteed. Final application thereto shall be determined on the job as conditions may demand and subject to the approval of the City.

D. Plans and Specifications Acknowledgment by Subcontractors and Suppliers

a. All Subcontractors and Suppliers must submit, through the General Contractor to the City's Engineer, a statement on their individual letterhead stationary, signed and sealed with their corporate seal, or a notarized statement on their letterhead stationery in the absence of a corporate seal, that the individual Subcontractor or Supplier:

i. Has received or reviewed a FULL set of approved plans and specifications for the project,

ii. Is aware that items concerning their particular trade may be shown and/or detailed in other trades or sections of the plans and specifications, and

iii. Will comply with said plans, specifications and all applicable codes and permit requirements.

E. In the event a Subcontractor or Supplier notes a mistake or details appear incomplete, or if there are questions or concerns with the plans and specifications, the Subcontractor or Supplier will immediately notify the General Contractor. No work will proceed until such conflicts or questions are resolved in writing.

F. The Subcontractor will not be permitted to start work, nor will any Shop drawings/submittals be accepted for review from a supplier until this letter of acknowledgment is received and approved by the General Contractor and City's Engineer. Also, the City will not process any pay request for the work of any Subcontractor or Supplier whose acknowledgment letter is not on file with the City.

1.7 REQUESTS FOR INTERPRETATION (RFIs)

A. Procedure

a. Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.

i. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.

ii. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI

a. Include a detailed, legible description of item needing interpretation and the following:

i. City Project Number

ii. City Project Name.

iii. Date.

iv. Name of Contractor.

v. RFI number, numbered sequentially.

vi. Specification Section number and title and related paragraphs, as appropriate.

vii. Drawing number and detail references, as appropriate.

viii. Field dimensions and conditions, as appropriate.

ix. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.

x. Contractor's signature.

xi. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

xii. Identify each page of attachments with the RFI number and sequential page number.

C. Software-Generated RFIs

a. Software-generated form with substantially the same content as indicated above.

i. Word Template is available upon request from the City's Engineer's Office.

ii. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Engineer's Action. Engineer will review each RFI, determine action required, and return it. Allow seven working days for Engineer's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.

a. The following RFIs will be returned without action:

i. Requests for approval of submittals.

ii. Requests for approval of substitutions.

iii. Requests for coordination information already indicated in the Contract Documents.

iv. Requests for adjustments in the Contract Time or the Contract Sum.

v. Requests for interpretation of Engineer's actions on submittals.

vi. Incomplete RFIs or RFIs with numerous errors.

b. Engineer's action may include a request for additional information, in which case Engineer's time for response will start again.

c. Engineer's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."

i. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Engineer in writing within 10 days of receipt of the RFI response.

E. On receipt of Engineer's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Engineer within seven days if Contractor disagrees with response.

F. RFI Log.

a. Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log bi-weekly. Include the following:

i. Project name.

ii. Name and address of Contractor.

iii. RFI number including RFIs that were dropped and not submitted.

iv. RFI description.

v. Date the RFI was submitted.

vi. Date Engineer's response was received.

vii. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

**PART 2 PRODUCTS (Not Applicable)**

**PART 3 EXECUTION (Not Applicable)**

**END OF SECTION**

## SECTION 01060 - REGULATORY REQUIREMENTS & PERMITS

### PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

A. CONTRACTOR shall comply with all building codes appropriate to the project, including those of:

a. National Electric Code.

b. Florida Building Code. (Latest Revision)

B. CONTRACTOR shall comply with these codes, laws, regulations, rules, directives of all agencies, boards, districts, and governmental bodies having jurisdiction.

C. CONTRACTOR shall obtain and pay the cost of all building permits, fees, tie-in or connection charges associated with the project.

D. The CONTRACTOR shall obtain construction permits from Broward County Planning and Environmental Regulation Division license(s), Florida Department of Environmental Protection, Fort Lauderdale Building Department and file a NOI with FDEP for NPDES compliance. Fort Lauderdale Building Permit will be available for pickup by CONTRACTOR once Notice to Proceed has been granted.

1.2 RELATED REQUIREMENTS

A. All applicable sections of the Specifications.

B. Conditions of the Contract.

1.3 MEASUREMENT AND PAYMENT

A. CONTRACTOR shall be reimbursed for permit fees as described in Section 01025.

### PART 2 PRODUCTS (Not Applicable)

### PART 3 EXECUTION (Not Applicable)

**END OF SECTION**

# SECTION 01070 - ABBREVIATIONS OF INSTITUTIONS

## PART 1 GENERAL

### 1.1 GENERAL

A. Wherever in these Specifications references are made to the standards, specifications, or other published data of the various international, national, regional, or local organizations, such organizations may be referred to by their acronym or abbreviation only. As a guide to the user of these Specifications, the following acronyms or abbreviations, which may appear in these Specifications, shall have the meanings indicated herein.

### 1.2 ABBREVIATIONS

| | |
|---|---|
| AAMA | Architectural Aluminum Manufacturer's Association |
| AAR | Association of American Railroads |
| AASHTO | American Association of State Highway and Transportation Officials |
| AATCC | American Association of Textile Chemists and Colorists |
| ACI | American Concrete Institute |
| AFBMA | Anti-Friction Bearing Manufacturer's Association, Inc. |
| AGA | American Gas Association |
| AGMA | American Gear Manufacturers Association |
| AHAM | Association of Home Appliance Manufacturers |
| AI | The Asphalt Institute |
| AIA | American Institute of Architects |
| AISC | American Institute of Steel Construction |
| AISI | American Iron and Steel Institute |
| AITC | American Institute of Timber Construction |
| AMCA | Air Moving and Conditioning Association |
| ANS | American Nuclear Society |
| ANSI | American National Standards Institute, Inc. |
| APA | American Plywood Association |
| API | American Petroleum Institute |
| APWA | American Public Works Association |
| ASA | American Standards Association |
| ASAE | American Society of Agricultural Engineers |
| ASCE | American Society of Civil Engineers |
| ASHRAE | American Society of Heating, Refrigerating, and Air Conditioning Engineers |
| ASLE | American Society of Lubricating Engineers |
| ASME | American Society of Mechanical Engineers |
| ASQC | American Society for Quality Control |
| ASSE | American Society of Sanitary Engineers |
| ASTM | American Society for Testing and Materials |
| AWPA | American Wood Preservers Association |
| AWPI | American Wood Preservers Institute |
| AWS | American Welding Society |
| AWWA | American Water Works Association |

| | |
|---|---|
| BBC | Basic Building Code, Building Officials & Code Administrators International |
| BCPERD | Broward County Planning and Environmental Regulation Division |
| BCHCED | Broward County Highway Construction and Engineering Division |
| BCHD | Broward County Health Department |
| BCTED | Broward County Traffic Engineering Division |
| BCWRMD | Broward County Water Resource Management Division |
| BCWWS | Broward County Water & Wastewater Services Division |
| BHMA | Builders Hardware Manufacturer's Association |
| CBM | Certified Ballast Manufacturers |
| CEMA | Conveyors Equipment Manufacturer's Association |
| CGA | Compressed Gas Association |
| CLFMI | Chain Link Fence Manufacturer's Institute |
| CMA | Concrete Masonry Association |
| CRSI | Concrete Reinforcing Steel Institute |
| DIPRA | Ductile Iron Pipe Research Association |
| EIA | Electronic Industries Association |
| ETL | Electrical Test Laboratories |
| EPA | Environmental Protection Agency |
| FBC | Florida Building Code |
| FDEP | Florida Department of Environmental Protection |
| FDOT | Florida Department of Transportation |
| FM | Factory Mutual System |
| FPL | Florida Power & Light |
| FS | Federal Specifications |
| HI | Hydraulics Institute |
| IAPMO | International Association of Plumbing and Mechanical Officials |
| ICBO | International Conference of Building Officials |
| IEEE | Institute of Electrical and Electronics Engineers |
| IES | Illuminating Engineering Society |
| IME | Institute of Makers of Explosives |
| IP | Institute of Petroleum (London) |
| IPC | Institute of Printed Circuits |
| IPCEA | Insulated Power Cable Engineers Association |
| ISA | Instrument Society of America |
| ISO | International Organization for Standardization |
| ITE | Institute of Traffic Engineers |
| MBMA | Metal Building Manufacturer's Association |
| MPTA | Mechanical Power Transmission Association |
| MSS | Manufacturers Standardization Society |
| MTI | Marine Testing Institute |
| NAAMM | National Association of Architectural Metal Manufacturer's |
| NACE | National Association of Corrosion Engineers |
| NBS | National Bureau of Standards |
| NCCLS | National Committee for Clinical Laboratory Standards |
| NEC | National Electrical Code |
| NEMA | National Electrical Manufacturer's Association |
| NFPA | National Fire Protection Association |
| NFPA | National Forest Products Association |
| NLGI | National Lubricating Grease Institute |
| NMA | National Microfilm Association |

| | |
|---|---|
| NSF | National Sanitation Foundation |
| NWMA | National Woodwork Manufacturers Association |
| OSHA | Occupational Safety and Health Administration |
| PCA | Portland Cement Association |
| PPI | Plastics Pipe Institute |
| RCRA | Resource Conservation and Recovery Act |
| RIS | Redwood Inspection Service |
| RVIA | Recreational Vehicle Industry Association |
| RWMA | Resistance Welder Manufacturer's Association |
| SAE | Society of Automotive Engineers |
| SAMA | Scientific Apparatus Makers Association |
| SB | Southern Bell |
| SFWMD | South Florida Water Management District |
| SMA | Screen Manufacturers Association |
| SMACCNA | Sheet Metal and Air Conditioning Contractors National Association |
| SPI | Society of the Plastics Industry, Inc. |
| SPIB | Southern Pine Inspection Bureau |
| SPR | Simplified Practice Recommendation |
| SSA | Swedish Standards Association |
| SSBC | Southern Standard Building Code, Southern Building Code Congress |
| SSPC | Steel Structures Painting Council |
| SSPWC | Standard Specifications for Public Works Construction |
| TAPPI | Technical Association of the Pulp and Paper Industry |
| TFI | The Fertilizer Institute |
| UL | Underwriters Laboratories, Inc. |
| WCLIB | West Coast Lumber Inspection Bureau |
| WCRSI | Western Concrete Reinforcing Steel Institute |
| WEF | Water Environment Federation |
| WIC | Woodwork Institute of California |
| WRI | Wire Reinforcement Institute, Inc. |
| WWPA | Western Wood Products Association |

**PART 2 PRODUCTS (Not Applicable)**

**PART 3 EXECUTION (Not Applicable)**

**END OF SECTION**

# SECTION 01090 - REFERENCE STANDARDS

## PART 1 GENERAL

1.1 GENERAL

A. Titles of Sections and Paragraphs

a. Captions accompanying specification sections and paragraphs are for convenience of reference only, and do not form a part of the Specifications.

B. Applicable Publications

a. Whenever in these Specifications references are made to published specifications, codes, standards, or other requirements, it shall be understood that wherever no date is specified, only the latest specifications, standards, or requirements of the respective issuing agencies which have been published as of the date that the WORK is advertised for bids, shall apply; except to the extent that said standards or requirements may be in conflict with applicable laws, ordinances, or governing codes. No requirements set forth herein or shown on the Drawings shall be waived because of any provision of, or omission from, said standards or requirements.

C. Specialists, Assignments

a. In certain instances, specification text requires (or implies) that specific work is to be assigned to specialists or expert entities, who must be engaged for the performance of that work. Such assignments shall be recognized as special requirements over which the CONTRACTOR has no choice or option. These requirements shall not be interpreted so as to conflict with the enforcement of building codes and similar regulations governing the WORK; also they are not intended to interfere with local union jurisdiction settlements and similar conventions. Such assignments are intended to establish which party or entity involved in a specific unit of work is recognized as "expert" for the indicated construction processes or operations. Nevertheless, the final responsibility for fulfillment of the entire set of contract requirements remains with the CONTRACTOR.

1.2 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of other requirements of the Specifications, all work specified herein shall conform to or exceed the requirements of applicable codes and the applicable requirements of the following documents.

B. References herein to "Building Code" shall mean "Florida Building Code". References to "Mechanical Code" or "Uniform Mechanical Code," "Plumbing Code" or "Uniform Plumbing Code," "Fire Code" or "Uniform Fire Code," shall mean Uniform Mechanical Code, Uniform Plumbing Code and Uniform Fire

Code of the International Conference of the Building Officials (ICBO). "Electric Code" or "National Electric Code (NEC)" shall mean the National Electric Code of the National Fire Protection Association (NFPA). The latest edition of the codes as approved by the Municipal Code and used by the local agency as of the date that the WORK is advertised for bids, as adopted by the agency having jurisdiction, shall apply to the WORK herein, including all addenda, modifications, amendments, or other lawful changes thereto.

C. In case of conflict between codes, reference standards, drawings and the other Contract Documents, the most stringent requirements shall govern. All conflicts shall be brought to the attention of the ENGINEER for clarification and directions prior to ordering or providing any materials or furnishing labor. The CONTRACTOR shall bid for the most stringent requirements.

D. The CONTRACTOR shall construct the WORK specified herein in accordance with the requirements of the Contract Documents and the referenced portions of those referenced codes, standards, and specifications listed herein.

E. References herein to "OSHA Regulations for Construction" shall mean Title 29, Part 1926, Construction Safety and Health Regulations, Code of Federal Regulations (OSHA), including all changes and amendments thereto.

F. References herein to "OSHA Standards" shall mean Title 29, Part 1910, Occupational Safety and Health Standards, Code of Federal Regulations (OSHA), including all changes and amendments thereto.

1.3 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format. The Specifications are organized into Divisions and Sections using the CSI/CSC's "MasterFormat" numbering system.

a. Section Identification

i. The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.

b. Division 01

i. Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.

B. Specification Content

a. 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:

i. 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.

ii. 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.

1.4 REGULATIONS RELATED TO HAZARDOUS MATERIALS

A. The CONTRACTOR is responsible that all work included in the Contract Documents, regardless if shown or not, shall comply with all EPA, OSHA, RCRA, NFPA, and any other Federal, State, and Local Regulations governing the storage and conveyance of hazardous materials, including petroleum products.

B. Where no specific regulations exist, all chemical, hazardous, and petroleum product piping and storage in underground locations must be installed with double containment piping and tanks, or in separate concrete trenches and vaults, or with an approved lining which cannot be penetrated by the chemicals, unless waived in writing by the OWNER.

**PART 2 PRODUCTS (Not Applicable)**

**PART 3 EXECUTION (Not Applicable)**

**END OF SECTION**

# SECTION 01152 - APPLICATIONS FOR PAYMENT

## PART 1 GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

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

B. Related Sections include the following:

a. Division 01 Section "Alteration Project Procedures" for administrative procedures for handling changes to the Contract.

b. Division 01 Section "Measurement and Payment" for administrative requirements governing use of unit prices.

c. Division 01 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

### 1.3 DEFINITIONS

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

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

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

c. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

i. Differentiate between items stored on-site and items stored off-site. For items stored off-site include evidence of insurance or bonded warehousing.

d. Provide separate line items in the Schedule of Values for initial cost of

materials, for each subsequent stage of completion, and for total installed value of that part of the Work.

e. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.

f. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

g. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as General Condition's expense, at Contractor's option.

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

1.5 APPLICATIONS FOR PAYMENT

A. The General Contractor must meet with the City Representative and Architect on or about the 25th of each month. The City Representative will go over the pay items and agree on the quantities and the dollar amounts of the work completed during the month. A copy of the agreed amounts will be signed by the parties and a copy will be left with each representative.

B. The General Contractor will make up a partial pay request using the City-supplied forms and submit the request to the City Representative before the first of the upcoming month.

C. Each pay request must be accompanied by an update construction schedule.

D. Each pay request must be accompanied by a partial release of lien by the General Contractor and by all Subcontractors, suppliers, and for all labor.

E. For each payment application requesting payment for undergrounding allowance for undergrounding work for overhead utilities, written authorization of payment from each utility being requested must be received with payment application.

F. For the final pay request, the General Contractor will be required to submit FINAL release of liens for ALL Subcontractors, suppliers, etc., and for ALL labor BEFORE FINAL PAYMENT WILL BE MADE.

G. No partial payments, after the first payment, will be made until all partial release of liens are submitted for the preceding month's billing, as described

H. Each Application for Payment shall be consistent with previous applications and payments as certified by and paid for by City.

I. Payment Application Forms: Use City Form “PERIODIC ESTIMATE FOR PARTIAL PAYMENT” as form for Applications for Payment.

a. Application Preparation. Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. City will return incomplete applications without action.

b. Entries shall match data on the Schedule of Values and Contractor’s Construction Schedule. Use updated schedules if revisions were made.

c. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.

J. Release of Lien. With each Application for Payment, submit release of lien from every entity who is lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.

a. Submit partial release of lien on each item for amount requested in previous application, after deduction for retainage, on each item.

b. When an application shows completion of an item, submit final release of lien.

c. City reserves the right to designate which entities involved in the Work must submit release of lien forms.

K. Initial Application for Payment. Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

a. List of subcontractors.

b. Schedule of Values.

c. Contractor's Construction Schedule (preliminary if not final).

d. Products list.

e. Submittals Schedule (preliminary if not final).

f. List of Contractor's staff assignments.

g. Copies of building permits.

h. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.

i. Initial progress report.

j. Report of preconstruction conference.

L. Final Payment Application. Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

a. Evidence of completion of Project closeout requirements.

b. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.

c. Updated final statement, accounting for final changes to the Contract Sum.

d. Evidence that claims have been settled.

e. Final liquidated damages settlement statement.

**PART 2 PRODUCTS (Not Applicable)**

**PART 3 EXECUTION (Not Applicable)**

**END OF SECTION**

# SECTION 01200 - PROJECT MEETINGS

## PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

A. Contractor shall schedule and administer a preconstruction meeting, progress meetings at a minimum of every two weeks on a day established by the CITY's Representative and specially called meetings throughout progress of the work.

a. Prepare agenda for meetings.

b. Distribute written notice of each meeting five (5) days in advance of meeting date.

c. Make physical arrangements for meetings.

d. Preside at meetings.

e. Record the minutes; include significant proceedings and decisions.

f. Reproduce and distribute copies of minutes within three days after each meeting.

i. To participants in the meeting.

ii. To parties affected by decisions made at the meeting.

iii. Furnish three copies of minutes to CITY’s Representative.

B. Representative of CONTRACTOR, subcontractor and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.

C. ENGINEER shall attend all meetings.

1.2 RELATED REQUIREMENTS

A. All applicable sections of the Specifications.

B. Conditions of the Contract.

1.3 PRE-CONSTRUCTION MEETING

A. Schedule after date of Notice to Proceed.

B. Location. A central site, convenient for all parties, designated by CITY's Representative.

C. Attendance:

a. The CONTRACTOR and its superintendent.

b. CITY'S ENGINEER and CITY'S ENGINEER'S professional consultants.

c. Resident Project Representative.

d. Representatives of the OWNER.

e. Major subcontractors.

f. Major Suppliers.

g. Governmental representatives as appropriate.

h. Others as requested by CONTRACTOR, CITY or CITY'S ENGINEER.

D. Suggested Agenda:

a. Distribution and discussion of:

i. List of major subcontractors and suppliers.

ii. Projected Construction Schedules.

iii. Shop drawings and other submittals.

iv. Traffic maintenance plan.

v. Community Public Relations.

b. Critical work sequencing.

c. Procurement of major equipment and materials requiring a long lead time.

d. Project Coordination

i. Designation of responsible personnel.

e. Procedures and processing of:

i. Field decisions.

ii. Proposal requests.

iii. Submittals.

iv. Change Orders.

v. Applications for Payment

f. Adequacy of distribution of Contract Documents.

g. Procedures for maintaining Record Documents.

h. Use of premises:

i. Office, work and storage areas.

ii. CITY’s requirements.

i. Construction facilities, controls and construction aids.

j. Temporary utilities.

k. Safety procedures.

l. Security procedures.

m. Housekeeping procedures.

1.4 PROGRESS MEETINGS

A. Contractor shall schedule regular biweekly meetings on a day established by the CITY's Representative as required.

B. Hold called meetings as required by progress of the work.

C. Location of the meetings. Project field office of CITY's Representative.

D. Attendance:

a. CITY's Representative and CITY's professional consultants as needed.

b. ENGINEER.

c. Subcontractors as active on the site.

d. Suppliers as appropriate to the agenda.

e. Governmental representatives as appropriate.

f. Others, as requested by CONTRACTOR, CITY or CITY’S ENGINEER.

E. Suggested Agenda:

a. Review, approval of minutes of previous meeting.

b. Review of work progress since previous meeting.

c. Field observations, problems, and conflicts.

d. Problems, which impeded Construction Schedule.

e. Review of off-site fabrication, delivery schedules.

f. Corrective measures and procedures to regain projected schedule.

g. Revisions to Construction Schedule.

h. Progress, schedule, during succeeding work period.

i. Coordination of schedules.

j. Community Public Relations.

k. Review submittal schedules; expedite as required.

l. Maintenance of quality standards.

m. Pending changes and substitutions.

n. Review proposed changes for:

   i. Effect on Construction Schedule and on completion date.

   ii. Effect on other contracts of the Project.

o. Other business.

**PART 2 PRODUCTS (NOT APPLICABLE)**

**PART 3 EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

# SECTION 01311 – CONSTRUCTION PROGRESS DOCUMENTATION

## PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

a. Preliminary Construction Schedule.

b. Contractor's Construction Schedule.

c. Submittals Schedule.

d. Daily construction reports.

e. Material location reports.

f. Field condition reports.

g. Special reports.

B. Related Sections include the following:

a. Section 01152 – Applications for Payment

b. Section 01050 – Project Management

c. Section 01340 – Submittal Procedures

d. Section 01311 – Construction Photographs

e. Section 01400 – Quality Control

1.3 DEFINITIONS

A. Activity. A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

a. Critical activities are activities on the critical path. They must start and finish

on the planned early start and finish times.

b. Predecessor Activity. An activity that precedes another activity in the network.

c. Successor Activity. An activity that follows another activity in the network.

B. CPM. Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

C. Critical Path. The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

D. Event. The starting or ending point of an activity.

E. Float. The measure of leeway in starting and completing an activity.

a. Float time is not for the exclusive use or benefit of either City or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.

b. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.

c. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

F. Fragnet. A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

G. Milestone. A key or critical point in time for reference or measurement.

H. Network Diagram. A graphic diagram of a network schedule, showing activities and activity relationships.

I. Resource Loading. The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 SUBMITTALS

A. Submittals Schedule. Submit three copies of schedule. Arrange the following information in a tabular format:

a. Scheduled date for first submittal.

b. Specification Section number and title.

c. Submittal category (action or informational).

d. Name of subcontractor.

e. Description of the Work covered.

f. Scheduled date for Engineer's final release or approval.

B. Preliminary Construction Schedule. Submit three opaque copies.

a. Approval of cost-loaded preliminary construction schedule will not constitute approval of Schedule of Values for cost-loaded activities.

C. Preliminary Network Diagram. Submit three opaque copies, large enough to show entire network for entire construction period. Show logic ties for activities.

D. Contractor's Construction Schedule. Submit three opaque copies of initial schedule, large enough to show entire schedule for entire construction period.

E. CPM Reports. Concurrent with CPM schedule, submit three copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.

a. Activity Report. List of all activities sorted by activity number and then early start date, or actual start date if known.

b. Logic Report. List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.

c. Total Float Report. List of all activities sorted in ascending order of total float.

F. Daily Construction Reports. Submit two copies at monthly intervals.

G. Material Location Reports. Submit two copies at monthly intervals.

H. Field Condition Reports. Submit two copies at time of discovery of differing conditions.

I. Special Reports. Submit two copies at time of unusual event.

1.5 COORDINATION

A. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.

a. Secure time commitments for performing critical elements of the Work from parties involved.

b. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

## PART 2 PRODUCTS

2.1 SUBMITTALS SCHEDULE

A. Preparation. Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.

a. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.

b. Initial Submittal. Submit concurrently with preliminary bar-chart schedule. Include submittals required during the first 20 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.

i. At Contractor's option, show submittals on the Preliminary Construction Schedule, instead of tabulating them separately.

c. Final Submittal. Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Procedures. Comply with procedures contained in AGC's "Construction Planning & Scheduling."

B. Time Frame. Extend schedule from date established for the Notice to Proceed to date of Final Completion.

C. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

a. Activities. Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following: The schedule shall clearly indicate the critical path and all activities associated with it. The dependencies shall be clearly delineated.

b. All activities with a time duration exceeding five (5) days shall be shown as separate items.

c. Include procurement process activities for the following long lead items and major items as separate activities in schedule. Procurement cycle activities

include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.

d. Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.

e. Where materials require more than one (1) week fabrication or order time, this order/fabrication time shall be shown.

D. Constraints. Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

a. City-Furnished Products. Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.

b. Work Restrictions. Show the effect of the following items on the schedule:

i. Use of premises restrictions.

ii. Environmental control.

c. Work Stages. Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:

i. Subcontract awards.

ii. Submittals.

iii. Purchases.

iv. Fabrication.

v. Sample testing.

vi. Deliveries.

vii. Installation.

viii. Tests and inspections.

ix. Adjusting.

x. Curing.

E. Milestones. Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, Final Completion, and Certificate of Occupancy.

F. Contract Modifications. For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

G. Computer Software. Prepare schedules using a program that has been developed specifically to manage construction schedules.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

A. Gantt-Chart Schedule. Submit a comprehensive, fully developed, horizontal Gantt- chart-type, Contractor's Construction Schedule within 10 days of date established for the Notice to Proceed. Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of Project.

B. Preparation. Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

2.4 REPORTS

A. Daily Construction Reports. Prepare a daily construction report recording the following information concerning events at Project site:

a. List of subcontractors at Project site.

b. List of separate contractors at Project site.

c. Approximate count of personnel at Project site.

d. Equipment at Project site.

e. Material deliveries.

f. High and low temperatures and general weather conditions.

g. Accidents.

h. Meetings and significant decisions.

i. Unusual events (refer to special reports).

j. Stoppages, delays, shortages, and losses.

k. Emergency procedures.

l. Orders and requests of authorities having jurisdiction.

m. Change Orders received and implemented.

n. Construction Change Directives received and implemented.

o. Services connected and disconnected.

p. Equipment or system tests and startups.

q. Partial Completions and occupancies.

r. Substantial Completions authorized.

B. Material Location Reports. At weekly intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

C. Field Condition Reports. Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

2.5 SPECIAL REPORTS

A. General. Submit special reports directly to City within one day of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events. When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise City in advance when these events are known or predictable.

**PART 3 EXECUTION**

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Contractor's Construction Schedule Updating. At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

a. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.

b. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.

c. As the Work progresses, indicate Actual Completion percentage for each

activity.

B. Distribution. Distribute copies of approved schedule to Engineer, City Representative, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

a. Post copies in Project meeting rooms and temporary field offices.

b. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

**END OF SECTION**

# SECTION 01 31 00

# PROJECT MANAGEMENT AND COORDINATION

## PART 1 GENERAL

### 1.00 GENERAL PROVISIONS

A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

### 1.01 SUMMARY

A. This Section specifies supervisory and administrative requirements for coordination of Work, including, but not limited to:

1. General coordination procedures
2. Coordination of work of employees and subcontractors.
3. Coordination drawings.
4. Request for Interpretation / Information (RFIs)
5. Expedition of work to assure compliance with schedules.
6. Coordination of Work with that of other contractors and work by Owner.
7. Compliance with orders and instructions of Architect or Owner.
8. Conservation.
9. Administrative and supervisory personnel.
10. Project meetings.

### 1.02 RELATED REQUIREMENTS

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

### 1.03 DEFINITIONS

A. RFI: Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

### 1.04 INFORMATIONAL SUBMITTALS

A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.

2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

B. Key Personnel Names: Within **10 days** of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.

1. Post copies of list in project meeting room, in temporary field office, on Project Web site, and by each temporary telephone. The General Contractor is responsible to keep list current at all times.

## 1.05 COORDINATION BY CONTRACTOR

A. Coordinate the Work of the Contract, including plumbing, mechanical and electrical work, and other subcontractors. Anticipate areas where the installation of plumbing, mechanical and electrical work will be restricted, congested, or difficult. Consult various affected subcontractors.

B. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.

C. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work.

## 1.06 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.

1. Architect will return RFIs submitted to Architect by other entities controlled by

Contractor with no response.

2. Coordinate and submit RFIs in a prompt manner to as to avoid delays in Contractor's work or work of subcontractors.
3. Submit RFI electronically using the Project Web Site.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Software-generated form with substantially the same content as indicated above, acceptable to Architect.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow **7 working days** for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

If a response cannot be returned to the General Contractor within the allocated time, the Architect shall notify the General Contractor of the delay and at date in which the response will be

1. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.

f. Requests for interpretation of Architect's actions on submittals.
g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 01 26 00 "Contract Modification Procedures."

a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within **10 days** of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Use software log that is part of Project Web site.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within **7 days** if Contractor disagrees with response.

1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

## 1.07 PROJECT WEB SITE

A. Provide, administer, and use Project Web site for purposes of hosting and managing project communication and documentation until Final Completion. Project Web site shall include the following functions:

1. Project directory.
2. Project correspondence.
3. Meeting minutes.
4. Contract modifications forms and logs.
5. RFI forms and logs.
6. Task and issue management.
7. Photo documentation.
8. Schedule and calendar management.
9. Submittals forms and logs.
10. Payment application forms.
11. Drawing and specification document hosting, viewing, and updating.

12. Reminder and tracking functions.
13. Archiving functions.

B. Provide up to seven Project Web site user licenses for use of the Owner, Owner's Commissioning Authority, Architect, and Architect's consultants. Provide eight hours of software training at Architect's office for Project Web site users.

C. On completion of Project, provide one complete archive copy(ies) of Project Web site files to Owner and to Architect in a digital storage format acceptable to Architect.

D. Contractor, subcontractors, and other parties granted access by Contractor to Project Web site shall execute a data licensing agreement in the form of Agreement acceptable to Owner and Architect.

## 1.08 SUBMITTALS

A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

1. Indicate relationship of components shown on separate Shop Drawings.
2. Indicate required installation sequences.
3. Refer to further requirements specified in this Section, and Division 22, Division 23 and Division 26 Sections for specific Coordination Drawing requirements for mechanical and electrical installations.

B. Staff Names: Within **15 days** of starting construction operations, submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities;

list addresses and telephone numbers, including mobile and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

## 1.09 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

## 1.10 PROJECT MEETINGS, GENERAL

A. Agendas: Prepare agendas for Project Meetings. Distribute copies to parties in attendance.

B. Meeting Notices: Prepare and distribute written notices of Project Meetings four working days in advance of each meeting.

C. Arrangements: Make physical arrangements for Project Meetings.

D. Preside at Project Meetings.

E. Minutes: Record minutes of Project Meetings, including significant procedures and decisions.

F. Distribution of Minutes: Reproduce and distribute copies of Project Meeting minutes within three working days after each meeting to participants of meeting, to parties affected by decisions made at meetings, and to Owner and Architect.

## 1.11 PRE-CONSTRUCTION MEETING

A. Schedule within **10 days** after date of Notice to Proceed.

B. Location: A central site, convenient for all parties.

C. Attendance: Require and notify the following to attend

1. Owner's Representative.
2. Architect and his Professional Consultants.
3. Resident Project Representative.
4. Contractor's Superintendent.
5. Major Subcontractors.
6. Major suppliers.
7. Others as appropriate.

D. Suggested Agenda:

1. Discussion of major subcontractors and suppliers.
2. Projected Construction Progress Schedules.
3. Critical work sequencing.
4. Major equipment deliveries and priorities.
5. Project Coordination, including designation of responsible personnel.
6. Procedures and processing of:
    a. Field decisions.
    b. Proposal Requests.
    c. Submittals.
    d. Change Orders.
    e. Application for Payment.
7. Adequacy of distribution of Contract Documents.
8. Procedures for maintaining Record Documents.
9. Use of premises:
    a. Office, work, and storage areas.
    b. Owner's requirements.
10. Construction facilities, controls, and construction aids.
11. Temporary utilities.
12. Safety and first-aid procedures.
13. Security procedures.
14. Housekeeping procedures.

## 1.12 PRE-INSTALLATION CONFERENCES

A. Conduct pre-installation conferences at site prior to construction activities which require coordination. Installers, manufacturer's representatives, and fabricators of materials or systems affected shall be required to attend. Advise Owner and Architect of scheduled meeting dates.

B. Do not allow affected work to proceed if the conference cannot be successfully concluded. Initiate actions necessary to resolve impediments to performance of the work and reconvene the conference at the earliest feasible date.

## 1.13 PROGRESS MEETINGS

A. Schedule regular periodic meetings, as required.

B. Hold called meetings as required by progress of the Work.

C. Location of the meetings: Project field office of Contractor.

D. Attendance: Require and notify the following to attend:

1. Owner, Architect, and his professional consultants as needed.
2. Subcontractors, as appropriate to the agenda.
3. Suppliers, as appropriate to the agenda.
4. Others.

E. Suggested Agenda:

1. Review and approval of minutes of previous meeting.
2. Review of Work progress since previous meeting.
3. Field observations, problems, conflicts.
4. Problems which impede Construction Progress Schedule.
5. Review of off-site fabrication, and delivery schedules.
6. Corrective measures and procedures to regain projected schedule.
7. Revisions to Construction Progress Schedule.
8. Progress schedule during succeeding work period.
9. Coordination of schedules.
10. Review submittal schedules; expedite as required.
11. Maintenance of quality standards.
12. Pending changes and substitutions.
13. Review proposed changes for:
    a. Effect on Construction Progress Schedule and on completion date.
    b. Effect on other contracts of the Project.
14. Other business.

## 1.10 COORDINATION MEETINGS

A. Conduct Coordination Meetings as necessary to properly coordinate the trades. Require representation of parties involved in coordination or planning of activities involved.

## 1.11 SPECIAL MEETINGS

A. Conduct Special Meetings as required throughout the course of the Work. Special meeting issues may include, but are not limited to:

1. Safety issues.
2. Labor issues.
3. Special schedule issues.

## 1.12 COORDINATION DRAWINGS

A. General: Submit coordination drawings for areas where close and careful coordination of trades is required. Contractor shall be fully responsible for coordinating trades, coordinating construction sequence and schedules, and coordinating actual installed location and interface of work.

B. Timing: Prior to fabricating materials or beginning work, supervise and direct the creation of one complete set of Coordination Drawings showing complete coordination and integration of work, including, but not limited to, structural, architectural, mechanical, plumbing, fire protection, elevators, and electrical disciplines.

C. Intent: Coordination Drawings are for the Contractor's use during construction and are not be construed as replacing Shop Drawings or Record Drawings. Architect's review of submitted Coordination Drawings shall not relieve Contractor from his overall responsibility for the coordination of work of the Contract.

D. Base Sheets: Contractor shall prepare and provide one accurately scaled set of building Coordination Drawing "base sheets" on reproducible transparencies showing all architectural and structural work. Base sheets shall be at appropriate scale; congested areas and sections through vertical shafts shall be at larger scale.

E. Plumbing: Contractor shall circulate Coordination Drawings to plumbing subcontractor and require plumbing subcontractor to accurately and neatly show actual size and location of all plumbing equipment and work. Plumbing subcontractor shall note apparent conflicts, suggest alternate solutions, and return the Coordination Drawings to the Contractor.

F. Electrical: Contractor shall circulate Coordination Drawings to electrical subcontractor and require electrical subcontractor to accurately and neatly show actual size and location of electrical equipment and work. Electrical subcontractor shall note apparent conflicts, suggest alternate solutions, and return Coordination Drawings to Contractor.

G. Other Subcontractors: Contractor shall circulate Coordination Drawings to other subcontractors whose work might conflict with other work. Require these subcontractors to accurately and neatly show actual size and location of their equipment and work. These subcontractors shall note apparent conflicts, suggest alternate solutions, and return Coordination Drawings to the Contractor.

**1.13 EXISTING UTILITIES**

A. Contractor shall notify public and private utility companies as required

by law in advance of construction so that existing utilities may be accurately located and identified by the appropriate agency or utility.

B. Give advance notice to public and private utility companies as required by law, and provide proper disposition, subject to Architect approval of existing pipe lines, conduits, sewers, drains, poles, wiring, and other utilities that interfere with work, whether or not they are specifically indicated on Drawings. Contractor shall immediately notify Architect and appropriate authorities when coming across an unknown utility line, and await decision as to how to dispose of same. When an existing utility line must be cut and plugged or capped, moved, or relocated, or has become damaged, Contractor shall notify Architect and utility company involved, and assure protection, support, or moving of utilities to adjust them to new work. Contractor shall be responsible for damage caused to existing, active utilities under work of this Contract, whether or not such utilities are indicated on Drawings, including resultant damages or injuries to persons or properties.

**END OF SECTION**

# SECTION 01320 - PROJECT RECORD DOCUMENTS

## PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

A. Maintain at the site of the OWNER a record copy of:

a. DRAWINGS.

b. Specifications.

c. Addenda.

d. Change Orders and other modifications to the Contract.

e. Approved Shop DRAWINGS, Product Data and Samples.

f. Field Test Records.

g. Stormwater Pollution Prevention Plan (SWPPP)

1.2 MAINTENANCE OF DOCUMENTS AND SAMPLES

A. Store documents and samples in CONTRACTOR's field office apart from documents used for construction:

a. Provide files and racks for storage of documents.

b. Provide locked cabinet or secure storage space for storage of samples.

B. File documents and samples in accordance with CSI format.

C. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.

D. Make documents and samples available at all times for inspection by OWNER and CITY PROJECT MANAGER.

1.3 MARKING DEVICES

A. Provide felt tip marking pens for recording information in the color cod designated by CITY PROJECT MANAGER.

1.4 RECORDING

A. Label each document, "PROJECT RECORD" in neat large printed letters, or by rubber stamp.

B. Record information concurrently with construction progress. Do not conceal any WORK until required information is recorded.

C. DRAWINGS: Legibly mark to record actual construction: (hard copy and ACAD format)

a. Horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

b. Location of internal utilities and appurtenances concealed in the construction, referenced to visible and accessible features of the structure.

c. Field changes of dimension and detail.

d. Changes made by Field Order or by Change Order.

e. Details not on original Contract DRAWINGS.

D. Specifications and Addenda; Legibly mark each Section to record:

a. Manufacturer, trade name, catalog number, and supplier of each produce and item of equipment actually installed.

b. Changes made by Field Order or by Change Order.

1.5 AS-BUILT AND RECORD DRAWINGS

A. The term 'AS-BUILT DRAWING' refers to drawings signed and sealed by a Florida registered surveyor and mapper (PSM) provided by the CONTRACTOR. As-built information will be provided to the Engineer of Record who will prepare or have prepared record drawings based on as-built information provided by the PSM and from information provided by the engineer's staff.

B. The as-built drawings cover sheet will be signed, sealed and dated by the PSM. The cover sheet will include the PSM's name, business name, PSM number, address and telephone number and contain the following statement:

"I hereby certify that the as-built location information of the potable water, reclaimed water, wastewater and drainage facilities shown on these drawings conforms to the minimum technical standards for land surveying in the State of Florida, Chapter 5J-17.050(10)(i) (Florida Administrative Code), as adopted by the Department of Agriculture and Consumer Services, Board of Professional Surveyors and Mappers, and that said as-builts are true and correct to the best of our knowledge and belief."

C. As-builts will contain the information on the design drawings, plus the following additional requirements:

a. As-builts are to document changes between the design and construction. All information that is incorrect due to changes during construction will be

corrected. Incorrect or no longer relevant information will be erased or struck through. Any facilities constructed in a horizontal or vertical location materially different (one-tenth foot horizontal, one-tenth foot vertical) than the design location will have their design location struck through and will be redrafted at the constructed location. Design drawing dimensioning to water and wastewater facilities will be corrected as necessary.

b. Drawings will be a complete set including cover sheet, index (if one was included in the approved design drawings) and any other sheets included in the approved design set. Standard detail sheets are not necessary.

c. Drawings will include the MINIMUM AS-BUILT AND RECORD DRAWING CONTENTS described in the City of Fort Lauderdale minimum standards.

D. The CONTRACTOR shall maintain full size (24"x36") field drawings to reflect the "as-built" items of WORK as the WORK progresses. Upon completion of the WORK, the CONTRACTOR shall prepare a record set of "AS-BUILT" DRAWINGS on full-size, reproducible material and an electronic file in .DWG format (AutoCAD, latest Version). One set of full size design DRAWINGS on reproducible material will be furnished to the CONTRACTOR by the design ENGINEER at the current square foot price. An electronic file of the design DRAWINGS on a compact disk will be furnished to the CONTRACTOR by the design ENGINEER at no additional cost (for as-built purposes only). No additional payment will be made for those "as-built" DRAWINGS.

E. The cost of maintaining record changes, and preparation of the AS-BUILT DRAWINGS shall be included in the unit prices bid for the affected items. Upon completion of the WORK, the CONTRACTOR shall furnish the CITY PROJECT MANAGER the reproducible AS-BUILT DRAWINGS and electronic files. The completed AS-BUILT DRAWINGS shall be delivered to the CITY PROJECT MANAGER at least 48 hours prior to final inspection of the WORK. The Final Inspection will not be conducted unless the AS-BUILT DRAWINGS are in the possession of the CITY PROJECT MANAGER.

F. The completed AS-BUILT DRAWINGS shall be certified by a Professional Surveyor and Mapper registered in the State of Florida. This certification shall consist of the surveyor's embossed seal bearing the registration number, the surveyor's signature and date on each sheet of the drawing set. In addition, the key sheet, cover sheet or first sheet of the plans set shall list the business address and telephone number of the surveyor. The final as-builts shall also be submitted using state plane coordinates. (NAVD 1988 for vertical; NAD '83 with '90 adjustment for horizontal).

G. Representative items of WORK that should be shown on the record DRAWINGS as verified, changed or added are shown below:

a. <u>Plans:</u>

i. Structure types, location with grade of rim and flow-line elevations.

ii. Sewer type, length, size and elevations.

iii. Utility type, length, size and elevation in conflict structures.

iv. All maintenance access structures, valves and hydrants within right-of-way.

v. Spot (critical) elevations at plateaued intersections. (P.C., P.T., and mid point of all intersections, etc.)

vi. Sewer laterals shall be stationed between maintenance access structures.

b. Pavement Marking and Signing Plans: Sign location where installed if different from plans.

c. Water and Sewer Plans: Location (horizontal and vertical) of all pipe lines, structures, fittings, services, valves and appurtenances, and water main / sanitary sewer pipe crossings.

H. The CONTRACTOR shall submit three sets of progress AS-BUILT DRAWINGS with each application for payment. These DRAWINGS shall accurately depict the WORK completed and for which payment is being requested.

I. The term 'RECORD DRAWING' refers to the final drawing set signed and sealed by the Engineer of Record. The Engineer of Record will prepare or have prepared record drawings based on as-built information provided by a PSM and from information provided by the engineer's staff. The Engineer of Record shall retain the signed and sealed 'as-built' drawings provided by the PSM with the other project records for possible review by CITY upon request. RECORD DRAWING shall meet the requirements of the Contract Documents.

J. AS-BUILT and RECORD DRAWINGS shall include the following contents at a minimum.

a. The amount of information required on as-built and record drawings will require the drawing author to organize its presentation in order to make the drawings readable. On occasion, it may be necessary to put water and wastewater information on separate sheets, and/or use a table to show coordinate information.

b. Show the location of easements used by the water and wastewater facilities.

c. Indicate pipe joint locations where water and wastewater or reclaimed water piping crosses.

d. Indicate the length of gravity wastewater piping and actual slope between manhole centers.

e. Show all abandoned in place facilities including the extent and method of abandonment.

f. Show elevations to the nearest tenth of a foot for:

i. Top of pipe for water mains, force mains and reclaimed water mains at vertical deflection points and every 200 feet along straight runs.

ii. Top of pipe of water or wastewater facilities where they cross all other facilities (drainage, telephone, cable TV, electric, etc.)

g. Show elevations to the nearest one hundredth of a foot for:

i. Manholes (MH) rims.

ii. Inverts of every gravity wastewater pipe and force main connections to MH.

iii. Lift station top of slab, bottom of wet well, influent pipe invert and control set points.

h. Coordinates will be provided for CITY maintained facilities, including:

i. Water mains, force mains and reclaimed water mains at deflection points and every 200 feet along straight runs.

ii. The center of each MH, fitting, valve, blow off, hydrant, water meter box, wastewater cleanout, lift station wetwell, double detector check or other non-pipe water or wastewater facility.

iii. The location of each connection to existing facilities.

iv. The corners (vertices) of all easements being granted to the CITY as a part of the project.

v. Other locations designated by CITY.

i. Show the changed location of any non-water/wastewater features so they are at the visually correct location relative to CITY maintained facilities.

j. Drawings shall include color photographs of all connections to existing CITY infrastructure as well as all critical utility crossings and where specifically required on the design drawings. The pictures will be taken with a GPS camera that automatically geotags the picture. A maximum of six photographs per sheet is acceptable. Each photograph shall have a minimum size of 8”x10”. Photographs shall have a density of 3.0 megapixel or greater. Plot resolution is to be minimum 300 dots per inch. Photographs shall normally be taken from a point between four feet (4’) and six feet (6’) above the subject infrastructure and shall show good detail in both shadow

and sunlit areas. Include a measuring device in the photo for scale and where applicable to indicate the depth or separation of the utilities. A symbol (i.e. an arrow) is to be used in the plan views indicating the location and direction of view for each photograph submitted. The symbol must include the photograph number. A caption under each photograph shall include the following information:

i. Photograph number

ii. Photograph description

iii. Date of photograph

iv. Location and direction of view (for example 201 NW 34 Street looking North)

v. State plane coordinates

vi. All photographs included in the drawings will also be provided to CITY in JPEG format on CD or DVD media. The CD or DVD will be labeled with the CITY project name and number. Individual photo files will be named using the same photograph number contained in the drawings.

k. The size and material of the piping shall be verified by the survey crew at the time of as-built.

l. As-builts of all drainage lines shall include the following information:

i. Rims, inverts, length of piping between structures, length of exfiltration trench, and weir elevations if applicable.

ii. The size and material of the piping shall be verified by the survey crew at the time of as-built.

m. As-builts for the edge of pavement and sidewalk locations shall include horizontal locations and shall indicate all deviations from the design plans.

n. All rock as-builts for parking lot, roadways and swales areas shall consist of the following:

i. Rock elevations at all high and low points, and at enough intermediate points to confirm slope consistency and every 50' for roadways.

ii. Rock as-builts shall be taken at all locations where there is a finish grade elevation shown on the design plans.

iii. All catch basin and maintenance access structure rim elevations shall be shown.

iv. Elevations around island areas will also be required.

v. As-builts shall be taken on all paved and unpaved swales prior to placement of asphalt and/or topsoil/sod, at enough intermediate points to confirm slope consistency and conformance to the plan details.

i. Note: Rock as-builts required prior to paving. Consultant shall review rock as-builts within five days of receipt.

o. Lake and canal bank as-builts shall include a key sheet of the lake for the location of cross sections. Lake and canal bank cross sections shall be plotted at a minimum of every 100 lf, unless otherwise specified. As-builts shall consist of the location and elevation of the top of bank, edge of water and the deep cut line, with the distance between each shown on the drawing.

p. Retention area as-built elevations shall be taken at the bottom of the retention area and at the top of bank. If there are contours indicated on the design plans, then they shall be as-built as well.

q. If a change is made via field order or deviation to any structure, pipeline, etc., a new location shall be noted on the as-builts. The CITY PROJECT MANAGER may request additional as-built information to verify horizontal or vertical locations.

1.6 SUBMITTAL

A. Submittals of final AS-BUILT DRAWINGS shall be made at the completion of

a. the water system;

b. the sewer system;

c. the entire project.

As-builts shall also be submitted with monthly pay requests. At Contract closeout, deliver all Record Documents to CITY PROJECT MANAGER, for presentation to the OWNER.

B. A complete set of AS-BUILT DRAWINGS shall be prepared and delivered to the CITY PROJECT MANAGER. WORK shall be performed by a Registered Professional Surveyor and Mapper shall include, but not be limited to the following:

a. Valve boxes, splice boxes, pull boxes, all underground utilities-waterlines, electrical runs, irrigation system, storm drainage pipe and structures, sanitary sewer lines and structures, finished necessary grades, benches, curbs, fences, walls, signs, light fixtures and other items as necessary in accordance with CITY Record Plan/As-built plan requirements.

C. Accompany submittal with transmittal letter in duplicate, containing:

a. Date.

b. Project title and number.

c. CONTRACTOR's name and address.

d. Title and number of each Record Document.

e. Signature of CONTRACTOR or authorized representative.

**PART 2 PRODUCTS (Not Applicable)**

**PART 3 EXECUTION (Not Applicable)**

**END OF SECTION**

# SECTION 01 33 00

# SUBMITTAL PROCEDURES

## PART 1 GENERAL

### 1.00 GENERAL PROVISIONS

A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

### 1.01 SUMMARY

A. This Section specifies administrative and procedural requirements for submittals required for performance of Work, including:

1. Progress schedules.
2. Submittal schedule.
3. Shop drawings.
4. Product data.
5. Samples.
6. Progress reports.
7. Construction photographs.

B. Administrative Submittals: Refer to requirements specified in other Division 1 Specification Sections, and other Contract Documents, for administrative submittals, including:

1. Permits.
2. Applications for payment.
3. Performance and payment bonds.
4. Insurance certificates.
5. List of subcontractors.

### 1.02 RELATED REQUIREMENTS

A. Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that directly relate to Work of this Section include, but are not limited to:

1. Section 01010, SUMMARY.
2. Section 01152, APPLICATION FOR PAYMENT.
3. Section 01 31 00, PROJECT MANAGEMENT AND COORDINATION; Coordination drawings.
4. Section 01 40 00, QUALITY REQUIREMENTS; Test reports.
5. Section 01 60 00, PRODUCT REQUIREMENTS; Manufacturer's instructions.
6. Section 01 70 00, PRODUCT REQUIREMENTS; Contractor list of Products.
7. Section 01 70 00, EXECUTION REQUIREMENTS; Survey and layout data submittals.
8. Section 01780, CLOSEOUT; Closeout submittals.

### 1.03 SUBMITTAL PROCEDURES

A. Prepare and submit submittals required by individual Specification Sections. Types of

submittals are indicated in individual Specification Sections.

1. Email: Prepare submittals as PDF package, and transmit to Architect by sending via email. Include PDF transmittal form. Include information in email subject line as requested by Architect.

   a. Architect will return annotated file. Annotate and retain one copy of file as a digital Project Record Document file.

2. Web-Based Project Software: Prepare submittals in PDF form, and upload to web- based Project software website. Enter required data in web-based software site to fully identify submittal.

B. General: Electronic copies of CAD Drawings of the Contract Drawings will not be provided by Architect for Contractor use in preparing submittals.

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

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
   a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

D. Submittals Schedule: Comply with requirements in this Section for list of submittals and time requirements for scheduled performance of related construction activities.

E. Processing Time: Timing of submittals and review time varies for shop drawings, samples, catalogue cuts, data and certificates; Refer to GENERAL CONDITIONS. Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal.

1. Initial Review: Allow fourteen **(14) days** for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Concurrent Review: Where concurrent review of submittals by Architect's consultants, Owner, or other parties is required, allow 14 days for initial review of each submittal.
3. Direct Transmittal to Consultant: Where the Contract Documents indicate that submittals may be transmitted directly to Architect's consultants, provide duplicate copy of transmittal to Architect. Submittal will be returned to Architect before being returned to Contractor.
4. If intermediate submittal is necessary, process it in same manner as initial submittal.
5. Allow fourteen **(14) days** for processing each resubmittal.
6. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing.

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

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 4 by 5 inches on label or beside title block to record Contractor review and approval markings and action taken by Architect.
3. Include the following information on label for processing and recording action taken:

a. Project name.
b. Date.
c. Name and address of Architect.
d. Name and address of Contractor.
e. Name and address of subcontractor.
f. Name and address of supplier.
g. Name of manufacturer.
h. Unique identifier, including revision number.
i. Number and title of appropriate Specification Section.
j. Drawing number and detail references, as appropriate.
k. Other necessary identification.

G. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.

H. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.

1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
2. Additional copies submitted for maintenance manuals will be marked with action taken and will be returned.

I. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Owner or Contractor.

1. On an attached separate sheet, prepared on Contractor letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.
2. Include Contractor certification stating that information submitted complies with requirements of the Contract Documents.
3. Transmittal Form: Use sample form included

J. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

K. Use for Construction: Use only final submittals with mark indicating action taken by Architect in connection with construction.

L. Product Schedule or List: Prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. Type of product. Include unique identifier for each product.
2. Number and name of room or space.
3. Location within room or space.

M. Contractor Construction Schedule: Comply with requirements specified within this Section.

N. Submittals Schedule: Comply with requirements specified within this Section.

O. Application for Payment: Comply with requirements in Section 01 29 00 PAYMENT

PROCEDURES.

P. Schedule of Values: Comply with requirements in Section 01 29 00 PAYMENT PROCEDURES.

Q. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use CSI Form 1.5A, a copy of which is included at the end of this Section. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. Number and title of related Specification Section(s) covered by subcontract.
3. Drawing number and detail references, as appropriate, covered by subcontract.

**1.04 PROGRESS SCHEDULE**

A. General: Refer to GENERAL CONDITIONS.

B. Timing: Submit progress schedule within 10 calendar days of Owner's issuance of a Notice to Proceed.

C. Preparation of Progress Schedule: Prepare fully developed, critical path method construction schedule as follows:

1. Construction Progress Schedule shall be prepared using critical path scheduling methods (CPM). Horizontal bar chart schedules will not be acceptable. CPM Schedule shall indicate as a minimum the following: (1) activity, (2) duration, (3) earliest start and finish times, (4) latest start and finish times, (5) float times, and (6) indication of "critical" and "non-critical" path activities.

D. Format of Listings: Order chronologically by start of each unit of Work. List units of Work by Specification Section title.

E. Content of Progress Schedule: Show complete sequence of construction by activity. Show dates of beginning and completion of each major element of construction.

E. Distribution: Print and distribute progress schedule to Architect, Owner, subcontractors, and other parties affected. Post copies in field office. Instruct recipients to report promptly to Contractor in writing problems apparent from projections shown on schedule.

F. Revisions: Update and reissue progress schedule monthly in conjunction with Application for Payment.

**1.05 SUBMITTAL SCHEDULE**

A. Timing: Prepare and issue complete Submittal Schedule in accordance with GENERAL CONDITIONS.

B. Preparation: Coordinate Submittal Schedule with Progress Schedule, and Schedule of Values.

C. Content of Submittal Schedule: Prepare schedule in order by Specification Section. Provide the following information for each submittal:

1. Scheduled date of initial submittal.
2. Specification Section number.

3. Submittal type.
4. Name of subcontractor or supplier.

D. Distribution: Print and distribute Submittal Schedule to Architect, Owner, subcontractors, and other parties affected. Post copies in field office.

E. Revisions: Update and reissue Submittal Schedule monthly in conjunction with Application for Payment.

## 1.06 SHOP DRAWINGS

A. Provide accurately prepared, large scale and detailed shop drawings prepared specifically for this Project on reproducible sheets. Show adjacent conditions and related work. Show accurate field dimensions where appropriate. Identify materials and products shown. Note special coordination required. Standard information prepared without specific reference to Project is not considered shop drawings.

B. Shop drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings.

C. Show every component of fabricated item, notes regarding manufacturing process, coatings and finishes, identifying numbers conforming to Contract Documents (i.e. stair numbers, door numbers, etc.), dimensions, and appropriate trade names. Show anchorage and fastening details, including type, size and spacing. Show material gage and thickness. Indicate welding details and joint types.

D. Shop Drawing Sheet Size: Refer to GENERAL CONDITIONS.

E. Submittal Quantities: Refer to GENERAL CONDITIONS.

## 1.07 PRODUCT DATA

A. Definition: Product data includes manufacturer's standard published literature, such as installation instructions, catalog cuts, color charts, rough-in diagrams, and wiring diagrams. When product data must be prepared specifically because standard published data is not suitable for use, submit as shop drawing.

B. Preparation: Mark each copy of product data to show applicable choices and options. Where published product data includes information on several products and choices, mark copies to clearly indicate information applicable to this Project.

C. Do not submit product data until compliance with requirements of Contract Documents has been confirmed.

D. Submittal Quantities: Submit product data in following quantities:

1. Architectural Work: Submit number of copies required by Contractor, plus additional two copies to be retained by Architect.
2. Consultant's Work: Submit number of copies required by Contractor, plus an additional three copies to be retained by Consultant, and an additional one copy to Architect. Forward copy of transmittal to Consultant. Consultant's review and comments will be made on copies returned to Architect, who will forward them to Contractor.

E. Installer Copy: Verify that installer of Work possesses a current copy of Architect-approved

product data prior to installation.

**1.08 SAMPLES**

A. Submit samples identical with materials and products to be installed. Where indicated, prepare samples to match Architect's sample. Label sample with description, source, manufacturer's name, and catalog number. Submit samples along with certifications that products comply with referenced standards.

B. Architect Review: Architect will review samples for confirmation of visual intent, color, pattern, texture, and type. Architect will not test samples for compliance with other specified requirements, which shall remain exclusive responsibility of Contractor.

C. Submittal Quantities: When variation in color, pattern, or texture can be expected in finish work, submit multiple samples (minimum of three) to show approximate limits of variations. Submit samples in following quantities:

1. Initial Selection: For initial selection of color, texture, and pattern, submit one full set of manufacturer's available samples.
2. Verification Samples: Submit three sets of samples selected. One set will be returned to Contractor for use at Project Site for quality control comparisons.

D. Distribution: Distribute additional sets of approved samples to subcontractors, suppliers, installers, and others required for proper performance of Work. Indicate distribution on transmittal forms.

**1.09 BI-WEEKLY PROGRESS REPORTS**

A. Prepare bi-weekly (every two weeks) construction Progress Reports. Record following information concerning events on Project Site:

1. List of subcontractors at site.
2. General weather conditions.
3. Accidents and unusual events.
4. Meetings and significant decisions.
5. Orders and requests by governing authorities.
6. Change orders received.
7. Equipment or system tests and start-ups.
8. Partial completions and occupancies.
9. Authorized substantial completions.

B. Distribution: Distribute copies to Architect weekly.

**1.10 CONSTRUCTION PHOTOGRAPHS**

A. General: Employ competent photographer to take construction record photographs monthly during course of Work.

B. Provide photographs taken at completion of major stages of construction as agreed upon with Architect and Contractor.

C. View and Quantities Required: At each specified time, photograph Project from three different views approved by Architect and Contractor. Provide three images of each view.

D. Digital Images: Provide images in uncompressed JPEG format, produced by a digital camera with minimum sensor size of 4.0 megapixels.

E. Identify and date each image.

F. Views Required: Illustrate condition of construction and state of progress.

G. Delivery of Images: Deliver electronic images as soon as processed, to Owner, Architect, Contractor and Project Record File.

1. Digital Images: Submit a complete set of digital image electronic files as a Project Record Document on CD-ROM. Identify electronic media with date photographs were taken.

H. Preconstruction Photographs: Before commencement of demolition, take color digital photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Architect and Contractor.

1. Take eight photographs to show existing conditions adjacent to property before starting the Work.
2. Take eight photographs of existing buildings and structures either on or adjoining property to accurately record physical conditions at start of construction.
3. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

## 1.11 ARCHITECT'S REVIEW

A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required and return it.

1. PDF Submittals: Architect will indicate, via markup on each submittal, the appropriate action as follows (Actions indicated below shall supercede those described in the AGREEMENT):

a. "NO EXCEPTION TAKEN": No corrections, no marks, Proceed: Resubmission not required.
b. "MAKE CORRECTIONS AS NOTED": Minor amount of corrections; all items can be fabricated without further corrections to original submittal; checking is complete and all corrections are deemed obvious without ambiguity. Resubmission not required.
c. "REVISE AND SUBMIT": Submittal does not conform to Contract Documents, and requires too many corrections. Architect will state reasons for rejection. Correct as noted and resubmit.
d. "REJECTED": Submittal does not conform to Contract Documents, and requires too many corrections, and is rejected for other justifiable reasons. Architect will state reasons for rejection. Do not fabricate.

2. Paper Submittals: Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action as follows (Actions indicated below shall supercede those described in the AGREEMENT):

a. "NO EXCEPTION TAKEN": No corrections, no marks, Proceed: Resubmission not required.
b. "MAKE CORRECTIONS AS NOTED": Minor amount of corrections; all items can be fabricated without further corrections to original submittal; checking is complete and all corrections are deemed obvious without ambiguity. Resubmission not required.
c. "REVISE AND SUBMIT": Submittal does not conform to Contract Documents,

and requires too many corrections. Architect will state reasons for rejection. Correct as noted and resubmit.

d. "REJECTED": Submittal does not conform to Contract Documents, and requires too many corrections, and is rejected for other justifiable reasons. Architect will state reasons for rejection. Do not fabricate.

3. Submittals by Web-Based Project Software: Architect will indicate, on Project software website, the appropriate action.

a. Actions taken by indication on Project software website have the following meanings:

1) Contractor has not yet determined the on-line software and format for submittals.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

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

E. Architect will return without review submittals received from sources other than Contractor

F. Submittals not required by the Contract Documents will be returned by Architect without action.

**1.12 DISTRIBUTION BY CONTRACTOR**

A. Distribution: Accepted Submittals, make prints and copies and distribute to Owner, subcontractors, suppliers, fabricators, and other parties requiring information from submittal for proper coordination and performance of Work. Print copies of shop drawings from accepted reproducible only.

**PART 2 PRODUCTS**
**Not Used.**

**PART 3 EXECUTION**
**Not Used.**

**END OF SECTION**

# SECTION 01380 – CONSTRUCTION PHOTOGRAPHS

## PART 1 GENERAL

1.1 GENERAL

A. Employ competent photographer to take construction record photographs periodically, monthly at a minimum, during course of the work.

1.2 RELATED REQUIREMENTS

A. Section 01010: Summary of Work.

B. Section 01152: Application for Payment.

1.3 PHOTOGRAPHY REQUIRED

A. Provide photographs taken on cutoff date for each scheduled application for Payment.

B. Provide photographs taken at each major stage of construction.

C. Provide photographs taken of change order work.

1.4 COSTS OF PHOTOGRAPHY

A. CONTRACTOR shall pay costs for specified photography and prints.

a. Parties requiring additional photography or prints will pay photographer directly.

1.5 DIGITAL PHOTOGRAPHY

A. At OWNER and ENGINEER's discretion, digital photography may be used for all construction photographs except aerial progress photographs.

## PART 2 PRODUCTS

2.1 PRINTS

A. Resolution:

a. Minimum 5.0 Megapixels.

## PART 3 EXECUTION

3.1 TECHNIQUE

A. Factual presentation.

B. Correct exposure and focus.

a. High resolution and sharpness.

b. Maximum depth-of-field.

c. Minimum distortion.

3.2 VIEWS REQUIRED

A. Photograph from locations to adequately illustrate condition of construction and state of progress.

B. Photographs shall include aerial photographs showing the entire construction area.

3.3 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section; it shall be included in the price of all other work.

**END OF SECTION**

# SECTION 01 40 00

# QUALITY REQUIREMENTS

## PART 1 GENERAL

### 1.01 REQUIREMENTS INCLUDED

A. CONTRACTOR will employ and pay for the services of an Independent Testing laboratory to perform all required testing: (All required testing services under the Contract and Permit Documents shall be provided by the CONTRACTOR through an independent testing firm.

1. CONTRACTOR shall cooperate with the laboratory to facilitate the execution of its required services.
2. Employment of the laboratory by the CONTRACTOR for specific testing shall in no way relieve the CONTRACTOR's obligations to perform the work of the Contract as specified.
3. The tests to be provided by the CONTRACTOR shall include, but not be limited to, the following:

a) Density
b) Proctor
c) Limerock Bearing Ratio (LBR)
d) Carbonate Content
e) Gradation
f) Plastic Index and Liquid Limit
g) Organic Content
h) Concrete Compressive Strength and Slump
i) Asphalt Extraction
j) Paints and Finishes: Chemical analysis; coating thickness
k) Any other tests as required to satisfy the specification requirements and any permitting agency requirements

B. OWNER will provide special inspector/threshold inspection (as required by law) and reserves the right, at his sole discretion, to select and pay for the services of an Independent Testing Laboratory to perform additional services and testing as may be in the Owner's best interest.

### 1.02 RELATED REQUIREMENTS

A. All applicable sections of the Specifications.

B. Conditions of the Contract: Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities.

### 1.03 QUALIFICATION OF LABORATORY

A. Meet "Recommended Requirements for Independent Laboratory Qualification", published by American Council of Independent Laboratories.

B. Meet basic requirements of ASTM E-329.

C. Authorized to operate in the state in which the project is located.

D. Submit copy of report of inspection of facilities made by Materials Reference Laboratory of Natural Bureau of Standards during the most recent tour of inspection, with memorandum of remedies of any deficiencies reported by the inspection.

E. Testing Equipment

1. Calibrated at reasonable intervals by devices of accuracy traceable to either:

a) National Bureau of Standards.

b) Accepted values of natural physical constants.

**1.04 LABORATORY DUTIES**

A. Cooperate with OWNER's Representative and CONTRACTOR; provide qualified personnel promptly on notice.

B. Perform specified inspections, sampling and testing of materials and methods of construction:

1. Comply with specified standards.

2. Conduct and interpret the tests and state in each report whether the test specimens comply with the requirements, and specifically state any deviations from Contract Documents

C. Promptly notify OWNER's Representative and CONTRACTOR of observed irregularities of deficiencies of work or products.

D. Promptly submit written report of each test and inspection; one copy each to OWNER, ARCHITECT, and CONTRACTOR, and one copy to Project Record Documents File. Each report shall include:

1. Date issued.
2. Project title, OWNER's project number, and parcel number.
3. Testing laboratory name, address, and telephone number.
4. Name and signature of laboratory inspector.
5. Date and time of sampling or inspection.
6. Record of temperature and weather conditions.
7. Date of test.
8. Identification of Product and Specification section.
9. Location of sample or test in the Project.
10. Type of inspection or test.
11. Results of tests and compliance with Contract Documents.
12. Interpretation of test results, when requested by OWNER or ARCHITECT.
13. Observations regarding compliance with Contract Documents.

E. Perform properly authorized additional services as required by OWNER's Representative.

**1.05 LIMITATIONS OF AUTHORITY OF TESTING LABORATORY**

A. Laboratory is not authorized to:

1. Release, revoke, alter, or enlarge on requirements of Contract Documents.

2. Approve or accept any portion of the Work, except as specifically authorized by the specifications.
3. Perform any duties of the Contractor.

## 1.06 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with laboratory personnel, provide access to Work, and to Manufacturer's operations.

B. Secure and deliver to the Laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.

C. Provide to the Laboratory the preliminary design mix proposed to be used for concrete, and other materials mixes which require control by the testing laboratory.

D. Furnish copies of Product test reports as required.

E. Furnish incidental labor and facilities:

1. To provide access to Work to be tested.
2. To obtain and handle samples at the Project site or at the source of the Product to be tested.
3. To facilitate inspections and tests.
4. For storage and curing of test samples.

F. Furnish verification of materials and equipment compliance with Contract Documents.

G. Identify materials to be tested or inspected by Testing Laboratory or Agency.

H. Notify Laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.

1. When tests or inspections cannot be performed after such notice, reimburse OWNER for laboratory personnel and travel expenses incurred due to Contractor negligence.

## 1.7 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, telephone number, and email address of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspection.

11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

## PART 2 PRODUCTS

**Not Used.**

## PART 3 EXECUTION

### 3.01 TEST AND INSPECTION LOG

A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:

1. Date test or inspection was conducted.
2. Description of the Work tested or inspected.
3. Date test or inspection results were transmitted to Architect.
4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

1. Submit log at Project closeout as part of Project Record Documents.

3.02 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section. It shall be included in the price for all other work.

**END OF SECTION**

# SECTION 01410 – TESTING LABORATORY SERVICES

## PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

A. CONTRACTOR will employ and pay for the services of an Independent Testing laboratory to perform all required testing: (All required testing services under the Contract and Permit Documents shall be provided by the CONTRACTOR through an independent testing firm.

a. CONTRACTOR shall cooperate with the laboratory to facilitate the execution of its required services.

b. Employment of the laboratory by the CONTRACTOR for specific testing shall in no way relieve the CONTRACTOR's obligations to perform the work of the Contract as specified.

c. The tests to be provided by the CONTRACTOR shall include, but not be limited to, the following

i. Density

ii. Proctor

iii. Limerock Bearing Ratio (LBR)

iv. Carbonate Content

v. Gradation

vi. Plastic Index and Liquid Limit

vii. Organic Content

viii. Concrete Compressive Strength and Slump

ix. Asphalt Extraction

x. Any other tests as required to satisfy an permitting agency requirements.

B. CONTRACTOR shall pay for all required testing, including bacteriological testing.

1.2 RELATED REQUIREMENTS

A. All applicable sections of the Specifications.

B. Conditions of the Contract: Inspections and testing required by laws, ordinances, rules, regulations, orders or approvals of public authorities.

1.3 QUALIFICATION OF LABORATORY

A. Meet "Recommended Requirements for Independent Laboratory Qualification", published by American Council of Independent Laboratories.

B. Meet basic requirements of ASTM E-329.

C. Authorized to operate in the state in which the project is located.

D. Submit copy of report of inspection of facilities made by Materials Reference Laboratory of Natural Bureau of Standards during the most recent tour of inspection, with memorandum of remedies of any deficiencies reported by the inspection.

E. Testing Equipment

a. Calibrated at reasonable intervals by devices of accuracy traceable to either:

i. National Bureau of Standards.

ii. Accepted values of natural physical constants.

1.4 LABORATORY DUTIES

A. Cooperate with OWNER's Representative and CONTRACTOR; provide qualified personnel after due notice.

B. Perform specified inspections, sampling and testing of materials and methods of construction:

a. Comply with specified standards.

b. Ascertain compliance of materials with requirements of Contract Documents.

C. Promptly notify OWNER's Representative and CONTRACTOR of observed irregularities of deficiencies of work or products.

D. Promptly submit written report of each test and inspection; one copy each to OWNER's Representative, OWNER, CONTRACTOR, and one copy to Record Document File. Each report shall include:

a. Date issued.

b. Project title, OWNER’S project number and Parcel number.

c. Testing laboratory name, address and telephone number.

d. Name and signature of laboratory inspector.

e. Date and time of sampling or inspection.

f. Record of temperature and weather conditions.

g. Date of test.

h. Identification of fill product and specification section.

i. Location of sample or test in the project area (i.e. station and offset or other relevant dimensioning).

j. Type of inspection or test.

k. Results of tests and compliance with Contract Documents.

l. Interpretation of test results, when requested by OWNER's Representative.

E. Perform additional tests as required by the OWNER's Representative.

1.5 LIMITATION OF AUTHORITY OF TESTING LABORATORY

A. Laboratory is not authorized to:

a. Release, revoke, alter or enlarge on requirements of Contract documents.

b. Approve or accept any portion of the work.

c. Perform any duties of the CONTRACTOR.

1.6 CONTRACTOR'S RESPONSIBILITIES

A. Cooperate with laboratory personnel and provide access to work.

B. Secure and deliver to the laboratory adequate quantities of representational samples of materials proposed to be used and which require testing.

C. Provide to the laboratory the preliminary design mix proposed to be used for concrete, and other material mixes, which require control by the Testing Laboratory.

D. Furnish copies of Products test reports as required.

E. Furnish incidental labor and facilities:

a. To provide access to work to be tested.

b. To obtain and handle samples at the project site or at the source of the

product to be tested.

c. To facilitate inspections and tests.

d. For storage of test samples.

F. Notify laboratory sufficiently in advance of operations to allow for laboratory assignment of personnel and scheduling of tests.

a. When tests or inspections cannot be performed after such notice, reimburse OWNER for laboratory personnel and travel expenses incurred due to CONTRACTOR's negligence.

**PART 2 PRODUCTS (Not Applicable)**

**PART 3 EXECUTION**

3.1 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section. It shall be included in the price for all other work.

**END OF SECTION**

# SECTION 01 43 39

# MOCK-UP REQUIREMENTS

## PART 1 GENERAL

### 1.00 GENERAL PROVISIONS

A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

### 1.01 SUMMARY

A. Furnish and install mock-ups suitable to illustrate finish colors, materials and methods of construction. Maintain mock-ups as standard of colors, patterns, materials, performance and workmanship for entire project.

B. Contractor shall be required to set aside a sufficient area dedicated exclusively for mock-up construction and exhibition for the entire life of the Contract.

### 1.02 RELATED REQUIREMENTS

A. Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that directly relate to Work of this Section include, but are not limited to:

1. Section 01010, SUMMARY.
2. Section 01 33 00, SUBMITTAL PROCEDURES.
3. Section 01 40 00, QUALITY REQUIREMENTS; Test reports.
4. Section 01 60 00, PRODUCT REQUIREMENTS; Manufacturer's instructions.
5. Section 01780, CLOSEOUT PROCEDURES; Closeout submittals.
6. Individual Specification Sections that specify field mock-ups of individual pieces of the Work.

### 1.03 SUBMITTALS

A. Shop Drawings of Mock-Ups: Provide large scale shop drawings for fabrication, installation, and erection of all parts of each mock-up. Provide plans, elevations, and details of anchorage, connections and accessory items.

B. Photographs of Mock-Ups: Submit photographs of mock-ups after completion of installation and acceptance of each mock-up.

C. Samples: Refer to individual Specification Sections for submittal requirements of mock-up components and coordinate accordingly.

### 1.04 QUALITY ASSURANCE

A. Design Modifications: Make design modifications to work only as required to meet performance

requirements and to coordinate the work. Indicate proposed design modifications on shop drawings. Maintain original design concept without altering profiles and alignments indicated.

**1.05 MOCK-UP SCHEDULE**

A. Contractor shall prepare “Mock-Up Site” immediately following mobilization to allow the maximum quantity of time for Architect’s viewing and examination.

B. Mock-ups shall be completed for Architect’s examination at least 45 days prior to scheduled start of construction or fabrication, as applicable for each type of work, unless otherwise specified.

**PART 2 PRODUCTS**

**2.01 MATERIALS AND PRODUCTS**

A. Provide materials, components, and products for assembly as specified in individual specification sections.

**PART 3 EXECUTION**

**3.01 GENERAL**

A. Refer to various individual Specification Sections for specific requirements regarding condition of surfaces, mockup size, erection, and erection tolerances.

**3.02 MOCK-UP PROCEDURES**

A. Provide mock-ups and field samples of finishes at project as required by individual Specification Sections.

1. Mock-ups shall not be used in final, completed work.
2. Architect may reject, or withhold action on mock-ups requiring coordination with other mock-ups until related mock-ups are constructed and reviewed by Architect.

B. Contractor shall erect field samples and mock-ups at the Project “Mock-Up Site”, at location acceptable to Architect. Size of individual mock-up, protection of mock-up and removal and disposal of mock-up shall be as specified in individual Specification Section.

C. Cotractor's Preparation of Mock-ups: Place permanent label or title block on each mock-up for identification. Indicate Project Name, Architect's Project Number, Specification Section number and title, date of mock-up, name and address of Owner, name and address of Architect, name and address of supplier, name of manufacturer, Drawing number and detail reference.

1. Modify and customize mock-ups as required to show interface with adjacent work and attachment to structures or building.

**3.03 PROTECTION OF MOCK-UPS**

A. Mock-ups shall be adequately protected from damage until they are no longer necessary.

**3.04 REMOVAL AND DISPOSAL OF MOCK-UPS**

A. Demolish and remove mock-ups from site at completion of the Project. Legally dispose of demolished mock-up materials.

**END OF SECTION**

# SECTION 01 50 00

# TEMPORARY FACILITIES AND CONTROLS

## PART 1 GENERAL

### 1.00 GENERAL PROVISIONS

A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

B. **NOTE: ALL CIVIL ENGINEERING RELATED SPECIFICATIONS ARE LOCATED IN THE TECHNICAL DRAWINGS PACKAGE AND ARE TO PREVAIL. ANY AND ALL SPECIFICATIONS IN SECTIONS HEREIN ARE TO BE SECONDARY OR SUPPLIMENTARY TO ANY SPECIFICATION REQUIREMENTS IN THE CIVIL ENGINEER'S TECHNICAL DRAWINGS.**

### 1.01 SUMMARY

A. This Section specifies construction facilities and temporary controls, including, but not limiting to:

1. Temporary utilities include, but are not limited to, the following:
   a. Sewers and drainage.
   b. Water service and distribution.
   c. Sanitary facilities, including toilets, wash facilities, and drinking-water facilities.
   d. Heating and cooling facilities.
   e. Ventilation.
   f. Electric power service.
   g. Lighting.
   h. Telephone service.

2. Support facilities include, but are not limited to, the following:
   a. Temporary sidewalks and paving.
   b. Dewatering facilities and drains.
   c. Project identification and temporary signs.
   d. Waste disposal facilities.
   e. Field offices.
   f. Storage and fabrication sheds.
   g. Lifts and hoists.
   h Temporary stairs.
   i. Construction aids and miscellaneous services and facilities.

3. Security and protection facilities include, but are not limited to, the following:
   a. Environmental protection.
   b. Stormwater control.
   c. Tree and plant protection.

d. Pest controlSite enclosure fence.
e. Security enclosure and lockup.
f. Barricades, warning signs, and lights.
g. Covered walkways.
h. Temporary enclosures.
i. Fire protection.

**1.02 RELATED REQUIREMENTS**

A. Examine Contract Documents for requirements that affect the Work of this Section. Other Specification Sections that directly relate to Work of this Section include, but are not limited to:

1. Section 01010, SUMMARY.
2. Section 01 55 00, VEHICULAR ACCESS AND PARKING.
3. Section 01 55 26, TRAFFIC CONTROL.
4. Section 01 56 39, TEMPORARY TREE AND PLANT PROTECTION.
5. Section 01 57 13, TEMPORARY EROSION AND SEDIMENT CONTROL.

**1.03 USE CHARGES**

A. General: Cost or use charges for temporary facilities are not chargeable to Owner, or Architect and shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, the following:

1. Owner's construction forces.
2. Occupants of Project.
3. Architect.
4. Testing agencies.
5. Personnel of authorities having jurisdiction.
6. Contractor – power and water at no cost.

B. Water Service: Contractor may hook up to existing water service and use the water at no charge to the Owner.

C. Electric Power Service: Contractor may hook up to existing on-site electric service locations for construction purposes at no charge to the Owner.

**1.04 SUBMITTALS**

A. Temporary Utility Reports: If requested by the Architect or Owner, submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.

B. Implementation and Termination Schedule: Within 15 days of date established for submittal of Contractor Construction Schedule, submit a schedule indicating implementation and termination of each temporary utility.

**1.05 QUALITY ASSURANCE**

A. Standards: Comply with ANSI A10.6, NECA's "Temporary Electrical Facilities," and NFPA 241.

1. Trade Jurisdictions: Assigned responsibilities for installation and operation of temporary

utilities are not intended to interfere with trade regulations and union jurisdictions.
2. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

## 1.06 PROJECT CONDITIONS

A. Temporary Utilities: At earliest feasible time, when acceptable to Owner, change over from use of temporary service to use of permanent service.

1. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

B. Conditions of Use: The following conditions apply to use of temporary services and facilities by all parties engaged in the Work:

1. Keep temporary services and facilities clean and neat.
2. Relocate temporary services and facilities as required by progress of the Work.

# PART 2 PRODUCTS

## 2.01 MATERIALS, GENERAL

A. General: Provide new materials. Undamaged, previously used materials in serviceable condition may be used if approved by Architect. Provide materials suitable for use intended. Materials may be new or used, but must be adequate in capacity for the required usage, must not create unsafe conditions, and must not violate requirements of applicable codes and standards.

B. Pavement: Comply with Section 32 12 16, BITUMINOUS CONCRETE PAVING; and Section 32 13 13, PORTLAND CEMENT CONCRETE PAVING.

C. Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.76-mm-) thick, galvanized steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top rails.

D. Plywood: Comply with the following:

1. Signs and Directory Boards: Provide exterior grade, Medium Density Overlay (MDO) plywood, conforming to USDC PS1, of size and thickness indicated.
2. Fences, Vision Barriers, and Safety Barriers: Provide exterior grade, C-D veneered plywood.

E. Paint: Comply with industry standards.

F. Tarpaulins: Fire-resistive labeled with flame-spread rating of 15 or less.

G. Water: Potable.

## 2.02 TEMPORARY UTILITIES

A. Scope: Temporary utility work includes, but is not limited to:

1. Water service and distribution.
2. Electric power and light.

B. Temporary Water Service and Distribution: Make arrangements with utility service company. Provide water for construction purposes, including water for drinking, hydroseeding, landscape maintenance, and fire protection. Pay costs for installation, maintenance, removal, and service charges for water used. Install branch piping with taps located so water is available through hoses throughout construction. Protect piping and fittings against freezing. Meter and pay all usage costs.

C. Temporary Electric Power and Light: Arrange with utility company to provide service required for power and lighting. Pay costs for service and for power used.

1. Provide circuit and branch wiring, with area distribution boxes located so power and lighting is available throughout construction by use of construction-type power cords.
2. Provide adequate artificial lighting where natural light is not adequate for work, and for areas accessible to public.
3. Work shall meet applicable requirements of NFPA 70 and Division 26, ELECTRICAL.

## 2.03 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES

A. Scope: Temporary construction and support facilities include, without limitation:

1. Temporary heat and cooling.
2. Field offices and storage sheds.
3. Sanitary facilities.
4. Temporary enclosures.
5. Construction aids.
6. Waste disposal services.
7. Water control.
8. Rodent and pest control.
9. Pollution and dust control.

B. Temporary Heat, Cooling and Ventilation: Provide temporary heat, cooling and ventilation required to maintain adequate environmental conditions to facilitate progress of Work, to meet manufacturers' specified minimum installation conditions, and to protect materials and finishes from damage due to temperature and humidity.

1. Ventilate enclosed areas for curing of installed materials, to disperse humidity, and to prevent hazardous accumulations of dust, fumes, vapors, and gases.
2. Portable heating and cooling units shall be standard approved units with controls.
3. Pay costs of installation, maintenance, operation, removal, and fuel consumed.

C. At Contractor Option - Contractor Field Offices and Sheds: Prior to installation of offices and sheds, consult with Architect and Owner on location, access, and

related facilities. Provide field offices and sheds as follows:

1. At Contractor's option, portable or mobile buildings may be used. Mobile units, when used, shall be modified for office use.
2. Temperature and Moisture Transmission Resistance: Compatible with occupancy and storage requirements.
3. Contractors Office and Facilities: Size units as required for general use and to provide space for project meetings.
4. Furnishings in Meeting Area: Provide conference table and chairs for at least ten people. Provide racks and files for Project Record Documents in, or adjacent to, the meeting area.
5. Other furnishings: Contractors option.
6. Miscellaneous Items: Provide one 10 in. outdoor type thermometer.
7. Storage Sheds: Provide types and sizes required to meet requirements of various trades and to adequately store and handle products. Provide heating and ventilation necessary to comply with manufacturer's product data and with code requirements for products stored.

D. Sanitary Facilities: Provide and maintain clean portable toilet facilities. Do not use permanent facilities within buildings.

E. Construction Aids: Provide construction aids and equipment required by personnel to facilitate execution of the Work; ladders, stairs, ramps, runways, platforms, railings, chutes, and other such facilities and equipment.

1. Refer to respective sections for particular requirements for each trade.
2. When permanent stair framing is in place, provide temporary treads, platforms, and railings, for use by construction personnel.

F. Hoisting Equipment and Machinery: The Contractor shall furnish, install, operate, and maintain in safe condition all vertical, stationary hoisting equipment and machinery required for his own use and for the use of all Subcontractors on the project to properly carry out and complete the work, except as may otherwise be specifically provided for in any of the trade sections of the Specifications.

1. The trade contractors shall provide their own horizontal hoisting and moving equipment, such as fork lifts, Lulls, palette movers, etc.
2. All vertical hoisting thus provided by the Contractor shall be without charge to the trades using same.
3. All hoisting equipment and machinery, and operation shall comply in all respects to the governing laws and codes.

G. Staging: Contractor shall furnish, erect, and maintain in safe condition all exterior staging and scaffolding required for his own use.

H. Waste Disposal: Maintain all areas free of extraneous debris. Initiate and maintain a specific program to prevent accumulation of debris at construction site, storage and parking areas, or along access roads and haul routes.

1. Provide containers for deposit of debris.
2. Prohibit overloading of trucks to prevent spillage on access and haul routes.
3. Provide periodic inspection of traffic areas to enforce requirements.

4. Schedule periodic collection and disposal of debris.
5. Provide additional collections and disposals of debris whenever the periodic schedule is inadequate to prevent accumulation.

I. Water Control: Provide methods to control surface water to prevent damage to Project, site, and adjoining properties. Control fill, grading, and ditching to direct surface drainage away from excavations, pits, tunnels, and other construction areas; and to direct drainage to proper runoff.

1. Provide, operate, and maintain hydraulic equipment of adequate capacity to control surface and water.
2. Dispose of drainage water in a manner to prevent flooding, erosion, or other damage to any portion of the site or to adjoining areas and properties.

J. Rodent and Pest Control: Provide rodent control as necessary to prevent infestation of construction and storage areas. Employ methods and use materials which will not adversely affect conditions at the site or on adjoining properties. Should rodenticides be considered necessary submit copies of proposed program to Owner and Architect. Use of rodenticide shall comply with manufacturer's published instructions and recommendations. Clearly indicate:

1. Area or areas to be treated.
2. Rodenticides to be used.
3. Manufacturer's printed instructions.
4. Pollution preventive measures to be employed.

K. Pollution Control: Provide methods, means, and facilities required to prevent contamination of soil, water, or atmosphere by the discharge of noxious substances from construction operations. Provide equipment and personnel, perform emergency measures required to contain any spillage and to remove contaminated soils or liquids.

1. Excavate and legally dispose of any contaminated earth off-site, and replace with suitable compacted fill and topsoil.
2. Take special measures to prevent harmful substances from entering public waters.
3. Prevent disposal of wastes, effluents, chemicals, or other such substances adjacent to streams, or in sanitary or storm sewers.
4. Provide systems for control of atmospheric pollutants.
5. Prevent toxic concentrations of chemicals.
6. Prevent harmful dispersal of pollutants to atmosphere.

L. Dust Control: Provide positive methods and apply dust control materials to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into the atmosphere.

## 2.04 SECURITY AND PROTECTION FACILITIES

A. Scope: Security and protection facilities includes, but is not limited to:

1. Temporary fire protection.
2. Barricades, warning signs, lights.
3. Temporary site enclosure fence.
4. Security procedures.

B. Temporary Fire Protection: Provide and maintain suitable fire protection equipment and services. Establish procedures for fire protection for welding and other potentially hazardous construction operations. Ascertain and comply with requirements of Project insurance carrier, Local Fire Department and the City of Fort Lauderdale Fire Marshal. Permanent fire protection system may be activated to meet these requirements. Replace fusible link heads and other expended or discharged components at time of Substantial Completion.

1. Locate temporary portable fire extinguishers in convenient locations, not less than one extinguisher per floor.
2. Store combustible materials in containers in fire-safe locations.
3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire protection facilities, stairways, and other access routes.

C. Barricades, Warning Signs, and Lights: Provide and maintain barricades, warning signs, warning lights, railings, walkways, and the like. Paint signs and barricades with appropriate colors, graphics, and warnings to inform public and job-site personnel of hazards.

D. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction.

E. Temporary Site Enclosure Fence: Prior to start of work at the Project site, install chain-link enclosure fence with suitably locked entrance gates. Locate fence to enclose substantially entire Project site, or that portion the Contractor establishes as required to encompass entire Project construction operation and as approved by Architect. Locate vehicular entrance gates in suitable relation to construction facilities; and to avoid interference with traffic on public thoroughfares.

1. Construct chain link fence in accordance with industry standards.

F. Security Procedures: Secure project against unauthorized entry at all times. Provide secure, locked, temporary entrances to prevent vandalism, theft, and similar violations of security.

1. Storage: Provide secure, locked facilities for areas where materials and equipment are stored.

## PART 3 EXECUTION

### 3.01 TEMPORARY FACILITIES, GENERAL

A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.

### 3.02 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

## 3.03 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.

1. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
2. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
3. Indicate methods to be used to avoid trapping water in finished work.

B. Exposed Construction Period: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Period: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard and replace stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows wet materials adequate time to dry before enclosing the material in gypsum board or other interior finishes.

D. Controlled Construction Period: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use temporary or permanent HVAC system to control humidity within ranges specified for installed and stored materials.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
    a. Hygroscopic materials that may support mold growth, including wood and gypsum-based products, that become wet during the course of construction and remain wet for 48 hours are considered defective and require replacing.
    b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.

c. Remove and replace materials that cannot be completely restored to their manufactured moisture level within 48 hours.

## 3.04 MAINTENANCE, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain temporary facilities in operating condition; repair damages immediately upon discovery. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour per day basis.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 01780 "Closeout Procedures." Clean and renovate permanent facilities that have been used during construction period.

**END OF SECTION**

# SECTION 01505 – MOBILIZATION

## PART 1 GENERAL

1.1 GENERAL

A. Mobilization shall include the obtaining of all permits; moving onto the site of all equipment; temporary buildings, and other construction facilities; and implementing security requirements; all as required for the proper performance and completion of the WORK. Mobilization shall include the following principal items:

a. Moving on to the site of all CONTRACTOR's equipment required for first month operations.

b. Installing temporary construction power, wiring, and lighting facilities.

c. Developing construction water supply.

d. Providing field office trailers for the CONTRACTOR, complete with all specified furnishings and utility services including telephones, telephone appurtenances, and copying machine.

e. Providing all on-site communication facilities, including telephones and radio pagers.

f. Providing on-site sanitary facilities and potable water facilities.

g. Arranging for and erection of CONTRACTOR's work, site access, and storage.

h. Obtaining all required permits (including Notice of Intent (NOI) and Stormwater Pollution Prevention Plan (SWPPP) permits as needed).

i. Having all OSHA required notices and establishment of safety programs.

j. Having the CONTRACTOR's superintendent at the job site full time.

k. Submitting initial submittals.

l. Audio-Visual preconstruction record as described in Section 01010.

m. Project identification and signs.

## PART 2 PRODUCTS (Not Applicable)

## PART 3 EXECUTION

3.1 PAYMENT FOR MOBILIZATION

D. The CONTRACTOR's attention is directed to the condition that no payment for mobilization or any part thereof will be approved for payment under the Contract until all mobilization items listed in Paragraph 1.01.A. above have been completed as specified.

**END OF SECTION**

# SECTION 01510 – TEMPORARY UTILITIES

## PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

A. Types. The types of utility services required for general temporary use at the project site include the following:

a. Water service (potable for certain uses)

b. Storm sewer

c. Sanitary sewer

d. Electric power service

e. Telephone service

B. It shall be the CONTRACTOR's responsibility to provide equipment that is adequate for the performance of the WORK under this Contract within the time specified. All equipment shall be kept in satisfactory operating condition, shall be capable of safety and efficiently performing the required WORK, and shall be subject to inspection and approval by the OWNER's representative at any time within the duration of the Contract. All work hereunder shall conform to the applicable requirements of the OSHA Standards for Construction.

1.2 JOB CONDITIONS

A. Scheduled Uses. The CONTRACTOR shall, in conjunction with establishment of job progress schedule, establish a schedule for implementation and termination of service for each temporary utility or facility; at earliest feasible time, and when acceptable to OWNER and ENGINEER change over from use of temporary utility service to permanent service.

## PART 2 PRODUCTS (Not Applicable)

## PART 3 EXECUTION

3.1 INSTALLATION OF POWER DISTRIBUTION SYSTEM

A. Power. The CONTRACTOR shall provide all necessary power required for its operations under the Contract, and shall provide and maintain all temporary power lines required to perform the WORK in a safe and satisfactory manner.

3.2 INSTALLATION OF LIGHTING

A. Construction Lighting. All WORK conducted at night or under conditions of deficient daylight shall be suitable lighted to insure proper WORK and to afford adequate facilities for inspection and safe working conditions.

3.3 WATER SUPPLY

A. General. The OWNER will furnish reasonable quantities of water required by the CONTRACTOR in performance of the WORK under the Contract; however, the CONTRACTOR shall provide all facilities necessary to convey the water from the OWNER-designated source to the points of use in accordance with the requirements of the Contract Document. The CONTRACTOR shall pay all permit and water charges.

B. Potable Water. All drinking water on the site during construction shall be furnished by the CONTRACTOR and shall be bottled water or water furnished in acceptable metal dispensers. Notices shall be posted conspicuously throughout the site warning the CONTRACTOR's personnel that piped water may be contaminated.

C. Water Connections. The CONTRACTOR shall not make connection to, or draw water from, any fire hydrant or pipeline without first obtaining permission of the authority having jurisdiction over the use of said fire hydrant or pipeline and from the agency owning the affected water system. For each such connection made, the CONTRACTOR shall first attach to the fire hydrant or pipeline a valve and a meter, if required by the said authority, of a size and type acceptable to said authority and agency. The CONTRACTOR shall pay all permit and water charges.

D. Removal of Water Connections. Before final acceptance of the WORK on the project, all temporary connections and piping installed by the CONTRACTOR shall be entirely removed, and all affected improvements shall be restored to their original condition, or better, to the satisfaction of the ENGINEER and to the agency owning the affected utility.

3.4 INSTALLATION OF SANITARY FACILITIES

A. Toilet Facilities. Fixed or portable chemical toilets shall be provided wherever needed for the use of CONTRACTOR's employees. Toilets at construction job sites shall conform to the requirements of Subpart D, Section 1926.51 of the OSHA Standards for Construction.

B. Sanitary and Other Organic Wastes. The CONTRACTOR shall establish a regular daily collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the CONTRACTOR or organic material wasted from any other source related to the CONTRACTOR's operations shall be disposed of away from the site in a manner satisfactory to the ENGINEER and in accordance with all laws and regulations pertaining thereto.

3.5 INSTALLATION OF FIRE PROTECTION

A. Fire Protection. The construction of the WORK shall be connected with the CONTRACTOR's water supply system and shall be adequately protected against damage by fire. Hose connections and hose, water casks, chemical equipment, or other sufficient means shall be provided for fighting fires in the

temporary structures and other portions of the WORK, and responsible persons shall be designated and instructed in the operation such fire apparatus so as to prevent or minimize the hazard of fire. The CONTRACTOR's fire protection program shall conform to the requirements of Subpart F of the OSHA Standards for Construction.

3.6 INSTALLATION OF COMMUNICATIONS

A. Telephone Services. The CONTRACTOR shall provide and maintain at all time during the progress of the WORK not less than one telephone in good working order, at its own field construction office, at or near the site of the WORK included in the Contract. Each such telephone shall be connected to an established exchange for toll service and with all other telephones utilized by the CONTRACTOR.

B. Telephone Use. The CONTRACTOR shall permit the ENGINEER, the OWNER, or their authorized representatives or employees free and unlimited use of said telephone facilities for all calls that do not involve published toll charges. Calls originated by the ENGINEER, the OWNER, their authorized representatives or employees who involve toll or the CONTRACTOR at the rates charged by the telephone company shall bill message unit charge to the OWNER.

3.7 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section; it shall be included in the lump sum price for Mobilization.

**END OF SECTION**

# SECTION 01520 – CONSTRUCTION AIDS

## PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

A. Furnish, install and maintain required construction aids, remove on completion of work.

1.2 RELATED REQUIREMENTS

A. All applicable sections of the Specifications.

B. Conditions of the Contract.

## PART 2 PRODUCTS

2.1 MATERIALS, GENERAL

A. Materials may be new or used, suitable for the intended purpose, but must not violate requirements of applicable codes and standards.

2.2 CONSTRUCTION AIDS

A. Provide construction aids and equipment required by personnel and to facilitate execution of the work; scaffolds, staging, ladders, stairs, ramps, runways, platforms, railings, hoists, cranes, chutes and other such facilities and equipment.

a. Refer to respective sections for particular requirements for each trade.

b. Provide protective coverings for finished surfaces.

B. Maintain facilities and equipment in first-class condition.

## PART 3 EXECUTION

3.1 PREPARATION

A. Consult with OWNER's Representative, review site conditions and factors which affect construction procedures and construction aids including adjacent properties and public facilities which may be affected by execution of the work.

3.2 GENERAL

A. Comply with applicable requirements specified in sections of Division 2 through 4 (as applicable).

B. Relocate construction aids as required by progress of construction, by storage or work requirements, and to accommodate legitimate requirements of OWNER and other Contractors employer at the site.

3.3 REMOVAL

A. Completely remove temporary materials, equipment and services:

a. When construction needs can be met by use of permanent construction.

b. At completion of project.

B. Clean, repair damage caused by installation or by use of temporary facilities.

a. Remove foundations and underground installations for construction aids.

b. Grade areas of site affected by temporary installations to required elevations and slopes, and clean the area.

C. Restore permanent facilities used for temporary purposes to specified condition.

3.4 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section, it shall be included in the price of all other work.

**END OF SECTION**

# SECTION 01530 – PROTECTION OF EXISTING FACILITIES

## PART 1 GENERAL

### 1.1 GENERAL

A. The CONTRACTOR shall protect all existing utilities and improvements not designated for removal and shall restore damaged or temporarily relocated utilities and improvements to a condition equal to or better than they were prior to such damage or temporary relocation, all in accordance with requirements of the Contract Documents.

B. The CONTRACTOR shall verify the exact locations and depths of all utilities shown and the CONTRACTOR shall make exploratory excavations of all utilities that may interfere with the WORK. All such exploratory excavations shall be performed as soon as practicable after award of the contract and, in any event, a sufficient time in advance of construction to avoid possible delays to the CONTRACTOR's work. When such exploratory excavations show the utility location as shown to be in error, the CONTRACTOR shall so notify the ENGINEER.

C. The number of exploratory excavations required shall be that number which is sufficient to determine the alignment and grade of the utility.

### 1.2 RIGHTS-OF-WAY

A. The CONTRACTOR shall not do any work that would affect any oil, gas, sewer, or water pipeline; any telephone, telegraph, or electric transmission line; any fence; or any other structure, nor shall the CONTRACTOR enter upon the rights-of-way involved until notified by the ENGINEER that the OWNER has secured authority from the proper party. After authority has been obtained, the CONTRACTOR shall give said party due notice of its intention to begin work, if required by said party, and shall remove, shore, support or otherwise protect such pipeline, transmission line, ditch, fence, or structure or replace the same. When two or more contracts are being executed at one time on the same or adjacent land in such manner that work on one contract may interfere with that on another, the OWNER shall determine the sequence and order of the WORK. When the territory of one contract is the necessary or convenient means of access for the execution of another contract, such privilege of access or any other reasonable privilege may be granted by the OWNER to the CONTRACTOR so desiring, to the extent, amount, in the manner, and at the times permitted. No such decision as to the method or time of conducting the WORK or the use of territory shall be made the basis of any claim for delay or damage, except as provided for temporary suspension of the WORK in the General Conditions of the Contract.

### 1.3 PROTECTION OF STREET OR ROADWAY MARKERS

A. The CONTRACTOR shall not destroy, remove, or otherwise disturb any existing survey markers or other existing street or roadway markers without proper

authorization. No pavement breaking or excavation shall be started until all survey or other permanent marker points that will be disturbed by the construction operations have been properly referenced. All survey markers or points disturbed by the CONTRACTOR shall be accurately restored after all streets or roadway resurfacing has been completed.

1.4 RESTORATION OF PAVEMENT

A. General. All paved areas including asphaltic concrete berms cut or damaged during construction shall be replaced with similar materials and of equal thickness to match the existing adjacent undisturbed areas, except where specific resurfacing requirements have been called for in the Contract Documents or in the requirements of the agency issuing the permit. All temporary and permanent pavement shall conform to the requirements of the affected pavement OWNER. All pavements which are subject to partial removal shall be neatly saw cut in straight lines.

B. Temporary Resurfacing. Wherever required by the public authorities having jurisdiction, the CONTRACTOR shall place temporary surfacing promptly after backfilling and shall maintain such surfacing for the period of time fixed by said authorities before proceeding with the final restoration of improvements.

C. Permanent Resurfacing. In order to obtain a satisfactory junction with adjacent surfaces, the CONTRACTOR shall saw cut back and trim the edge so as to provide a clean, sound, vertical joint before permanent replacement of an excavated or damaged portion of pavement. Damaged edges of pavement along excavations and elsewhere shall be trimmed back by saw cutting in straight lines. All pavement restoration and other facilities restoration shall be constructed to finish grades compatible with adjacent undisturbed pavement.

D. Restoration of Sidewalks or Private Properties. Wherever sidewalks or private properties and driveways have been removed for purposes of construction, the CONTRACTOR shall place suitable temporary sidewalks or driveways promptly after backfilling and shall maintain them in satisfactory condition for the period of time fixed by the authorities having jurisdiction over the affected portions before proceeding with the final restoration or, if no such period of times is so fixed, the CONTRACTOR shall maintain said temporary sidewalks or driveways until the final restoration thereof has been made. The CONTRACTOR shall restore all private properties within thirty (30) days after a complaint is received by the OWNER.

1.5 EXISTING UTILITIES AND IMPROVEMENTS

A. General. The CONTRACTOR shall protect all Underground Utilities and other improvements which may be impaired during construction operations. It shall be the CONTRACTOR's responsibility to ascertain the actual location of all existing utilities and other improvements that will be encountered in its construction operations, and to see that such utilities or other improvements are adequately protected from damage due to such operations. The CONTRACTOR shall take all possible precautions for the protection of unforeseen utility lines to provide for

uninterrupted service and to provide such special protection as may be necessary.

B. Utilities to be Moved. In the case it shall be necessary to move the property of any public utility or franchise holder, such utility company or franchise holder will, upon request of the CONTRACTOR, be notified by the OWNER to move such property within a specified reasonable time. When utility lines that are to be removed are encountered within the area of operations, the CONTRACTOR shall notify the ENGINEER a sufficient time in advance for the necessary measures to be taken to prevent interruption of service.

C. Where the proper completion of the WORK requires the temporary or permanent removal and/or relocation of an existing utility or other improvement which is indicated, the CONTRACTOR shall remove and, without unnecessary delay, temporarily replace or relocate such utility or improvement in a manner satisfactory to the ENGINEER and the OWNER of the facility. In all cases of such temporary removal or relocation, restoration to former location shall be accomplished by the CONTRACTOR in a manner that will restore or replace the utility or improvement as nearly as possible to its former locations and to as good or better condition than found prior to removal.

D. OWNER's Right of Access. The right is reserved to the OWNER and to the OWNERs of public utilities and franchises to enter at any time upon any public street, alley, right-of-way, or easement for the purpose of making changes in their property made necessary by the WORK of this Contract.

E. Underground Utilities Indicated. Existing utility lines that are indicated or the locations of which are made known to the CONTRACTOR prior to excavation and that are to be retained, and all utility lines that are constructed during excavation operations shall be protected from damage during excavation and backfilling and, if damaged, shall be immediately repaired or replaced by the CONTRACTOR.

F. Underground Utilities Not Indicated. In the event that the CONTRACTOR damages any existing utility lines that are not indicated or the locations of which are not made known to the CONTRACTOR prior to excavation, a written report thereof shall be made immediately to the ENGINEER. If directed by the ENGINEER, repairs shall be made by the CONTRACTOR under the provisions for changes and extra work contained in the General Conditions.

G. All costs of locating, repairing damage not due to failure of the CONTRACTOR to exercise reasonable care, and removing or relocating such utility facilities not shown in the Contract Documents with reasonable accuracy, and for equipment on the project which was actually working on that portion of the work which was interrupted or idled by removal or relocation of such utility facilities, and which was necessarily idled during such work will be paid for as extra work in accordance with the provisions of the General Conditions.

H. Approval of Repairs. All repairs to a damaged utility or improvement are subject to inspection and approval by an authorized representative of the utility or improvement OWNER and the ENGINEER before being concealed by backfill or

other work.

I. Maintaining in Service. All oil and gasoline pipelines, power, and telephone or the communication cable ducts, gas and water mains, irrigation lines, sewer lines, storm drain lines, poles, and overhead power and communication wires and cables encountered along the line of the WORK shall remain continuously in service during all the operations under the Contract, unless other arrangements satisfactory to the ENGINEER are made with the owner of said pipelines, duct, main, irrigation line, sewer, storm drain, pole, or wire or cable. The CONTRACTOR shall be responsible for and shall repair all damage due to its operations, and the provisions of this Section shall not be abated even in the event such damage occurs after backfilling or is not discovered until after completion of the backfilling.

J. Existing Water Services. CONTRACTOR shall protect and provide temporary support for existing water services. Any water service damaged by the CONTRACTOR shall be replaced at the CONTRACTOR's expense, with a new water service complete with new water main tap.

1.6 TREES WITHIN STREET RIGHTS-OF-WAY AND PROJECT LIMITS

A. General. The CONTRACTOR shall exercise all necessary precautions so as not to damage or destroy any trees or shrubs, including those lying within street rights-of- way and project limits, and shall not trim or remove any trees unless such trees have been approved for trimming or removal by the jurisdictional agency or OWNER. All existing trees and shrubs which are damaged during construction shall be trimmed or replaced by the CONTRACTOR or a certified tree company under permit from the jurisdictional agency and/or the OWNER. Tree trimming and replacement shall be accomplished in accordance with the following paragraphs.

B. Trimming. Symmetry of the tree shall be preserved; no stubs or splits or torn branches left; clean cuts shall be made close to the trunk or large branch. Spikes shall not be used for climbing live trees. All cuts over 1-1/2 inches in diameter shall be coated with an asphaltic emulsion material.

C. Replacement. The CONTRACTOR shall immediately notify the jurisdictional agency and/or the OWNER if any tree is damaged by the CONTRACTOR's operations. If, in the opinion of said agency or the OWNER, the damage is such that replacement is necessary, the CONTRACTOR shall replace the tree at CONTRACTOR’s own expense. The tree shall be of a like size and variety as the tree damaged, or, if of a smaller size, the CONTRACTOR shall pay to the OWNER of said tree a compensatory payment acceptable to the tree OWNER, subject to the approval of the jurisdictional agency or OWNER. The size of the trees shall be not less than 1-inch diameter nor less than 6 feet in height.

1.7 NOTIFICATION BY THE CONTRACTOR

A. Prior to any excavation in the vicinity of any existing underground facilities, including all water, sewer, storm drain, gas, petroleum products, or other pipelines; all buried electric power, communications, or television cables; all traffic signal and

street lighting facilities; and all roadway and state highway rights-of-way the CONTRACTOR shall notify the respective authorities representing the OWNERs or agencies responsible for such facilities not less than 3 days nor more than 7 days prior to excavation so that a representative of said OWNERs or agencies can be present during such work if they so desire. The CONTRACTOR shall also notify the Sunshine State One Call Center 1-800-432-4770 at least 2 days, but no more than 14 days, prior to such excavation.

## PART 2 PRODUCTS

2.1 MATERIALS, GENERAL

A. Materials may be new or used, suitable for the intended purpose, but must not violate requirements of applicable codes and standards.

2.2 FENCING

A. Materials to CONTRACTOR's option, minimum fence height = 6 feet.

2.3 BARRIERS

A. Materials to CONTRACTOR's option, as appropriate to serve required purpose.

## PART 3 EXECUTION

3.1 GENERAL

A. Install facilities of a neat and reasonable uniform appearance, structurally adequate for required purposes.

B. Maintain barriers during entire construction period.

C. Relocate barriers as required by progress of construction.

3.2 TREE AND PLANT PROTECTION

A. Preserve and protect existing trees and plants adjacent to work areas.

B. Consult with OWNER's Representative and remove agreed-on roots and branches which interfere with work.

a. Employ qualified tree surgeon to remove branches, and to treat cuts.

C. Protect root zones of trees and plants.
a. Do not allow vehicular traffic and parking.

b. Do not store materials or products.

c. Prevent dumping of refuse or chemically injurious materials or liquids.

d. Prevent puddling or continuous running water.

D. Carefully supervise all work to prevent damage.

E. Replace trees and plants which are damaged or destroyed due to work operations under this contract.

3.3 REMOVAL

A. Completely remove barricades, including foundations, when construction has progressed to the point that they are no longer needed, and when approved by OWNER's Representative.

B. Clean and repair damage caused by installation, fill and grade areas of the site to required elevations and slopes, and clean the area.

3.4 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section, it shall be included in the price of all other work.

**END OF SECTION**

# SECTION 01550 – SITE ACCESS AND STORAGE

## PART 1 GENERAL

1.1 HIGHWAY LIMITATIONS:

A. The CONTRACTOR shall make its own investigation of the condition of available public and private roads and of clearances, restrictions, bridge load limits, and other limitations affecting transportation and ingress and egress to the site of the WORK. It shall be the CONTRACTOR's responsibility to construct and maintain any haul roads required for its construction operations.

1.2 TEMPORARY CROSSINGS:

A. General. Continuous, unobstructed, safe, and adequate pedestrian and vehicular access shall be provided to fire hydrants, commercial and industrial establishments, churches, schools, parking lots, service stations, motels, fire and police stations, and hospitals. Safe and adequate public transportation stops and pedestrian crossings at intervals not exceeding 300 feet shall be provided. The CONTRACTOR shall cooperate with parties involved in the delivery of mail and removal of trash and garbage so as to maintain existing schedules for such services. Vehicular access to residential driveways shall be maintained to the property line except when necessary construction precludes such access for reasonable periods of time.

B. Temporary Bridges. Wherever necessary, the CONTRACTOR shall provide suitable temporary bridges or steel plates over unfilled excavations, except in such cases as the CONTRACTOR shall secure the written consent of the individuals or authorities concerned to omit such temporary bridges or steel plates, which written consent shall be delivered to the ENGINEER prior to excavation. All such bridges or steel plates shall be maintained in service until access is provided across the backfilled excavation. Temporary bridges or steel plates for street and highway crossing shall conform to the requirements of the authority having jurisdiction in each case, and the CONTRACTOR shall adopt designs furnished by said authority for such bridges or steel plates, or shall submit designs to said authority for approval, as may be required.

C. Street Use. Nothing herein shall be construed to entitle the CONTRACTOR to the exclusive use of any public street, alleyway, or parking area during the performance of the WORK hereunder, and it shall so conduct its operations as not to interfere unnecessarily with the authorized work of utility companies or other agencies in such streets, alleyways, or parking areas. No street shall be closed to the public without first obtaining permission of the ENGINEER and proper governmental authority. Where excavation is being performed in primary streets or highways, one lane in each direction shall be kept open to traffic at all times unless otherwise indicated. Toe boards shall be provided to retain excavated material if required by the ENGINEER or the agency having jurisdiction over the street or highway. Fire hydrants on or adjacent to the WORK shall be kept accessible to fire-fighting equipment at all times. Temporary provisions shall be made by the CONTRACTOR to assure the use of sidewalks and the proper

functioning of all gutters, storm drain inlets, and other drainage facilities.

D. Traffic Control

a. For the protection of traffic in public or private streets and ways, the CONTRACTOR shall provide, place, and maintain all necessary barricades, traffic cones, warning signs, lights, and other safety devices in accordance with the requirements of Broward County and the "Manual of Uniform Traffic Control Devices, Part VI - Traffic Controls for Street and Highway Construction and Maintenance Operations," published by U.S. Department of Transportation, Federal Highway Administration (ANSI D6.1).

b. The CONTRACTOR shall take all necessary precautions for the protection of the WORK and the safety of the public. All barricades and obstructions shall be illuminated at night, and all lights shall be kept burning from sunset until sunrise. The CONTRACTOR shall station such guards or flaggers and shall conform to such special safety regulations relating to traffic control as may be required by the public authorities within their respective jurisdictions. All signs, signals, and barricades shall conform to the requirements of the Florida Department of Transportation.

c. The CONTRACTOR shall submit 3 copies of a traffic control plan to the ENGINEER for approval a minimum of 2 weeks prior to construction. The ENGINEER reserves the right to observe these traffic control plans in use and to make any changes as field conditions warrant. Any changes shall supersede these plans and be done solely at the CONTRACTOR's expense.

d. The CONTRACTOR shall remove traffic control devices when no longer needed, repair all damage caused by installation of the devices, and shall remove post settings and backfill the resulting holes to match grade.

E. Temporary Driveway Closure. The CONTRACTOR shall notify the OWNER or occupant (if not Owner-occupied) of the closure of the driveways to be closed more than one eight-hour work day at least 3 working days prior to the closure. The CONTRACTOR shall minimize the inconvenience and minimize the time period that the driveways will be closed. The CONTRACTOR shall fully explain to the OWNER/occupant how long the work will take and when closure is to start. Total closure time shall not exceed 5 days.

1.3 CONTRACTOR'S WORK AND STORAGE AREA:

A. The CONTRACTOR shall designate and arrange for the use of a portion of the property, adjacent to the WORK for its exclusive use during the term of the Contract as a storage and shop area for its construction operations relative to this Contract.

B. The CONTRACTOR shall make its own arrangements for any necessary off-site storage or shop areas necessary for the proper execution of the WORK.

C. The CONTRACTOR shall construct and use a separate storage area for hazardous materials used in constructing the WORK.

a. For the purpose of this paragraph, hazardous materials to be stored in the separate area are all products labeled with any of the following terms: Warning, Caution, Poisonous, Toxic, flammable, Corrosive, Reactive, or Explosive. In addition, whether or not so labeled, the following materials shall be stored in the separate area: diesel fuel, gasoline, new and used motor oil, hydraulic fluid, cement, paints and paint thinners, two-part epoxy coatings, sealants, asphaltic products, glues, solvents, wood preservatives, sand blast materials, and spill absorbent.

b. Hazardous materials shall be stored in groupings according to the Material Safety Data Sheets.

c. The CONTRACTOR shall develop and submit to the ENGINEER a plan for storing and disposing of the materials above.

d. The CONTRACTOR shall obtain and submit to the ENGINEER a single EPA number for wastes generated at the site.

e. The separate storage area shall meet all the requirements of all authorities having jurisdiction over the storage of hazardous materials.

f. All hazardous materials which are delivered in containers shall be stored in the original containers until use. Hazardous materials which are delivered in bulk shall be stored in containers which meet the requirements of authorities having jurisdiction.

1.4 PARKING:

A. The CONTRACTOR shall:

a. Provide temporary parking areas for ENGINEER and OWNER’s use.

b. The CONTRACTOR shall direct its employees to park in designated areas secured by the CONTRACTOR.

c. Traffic and parking areas shall be maintained in a sound condition, free of excavated material, construction equipment, mud, and construction materials. The CONTRACTOR shall repair breaks, potholes, low areas which collect standing water, and other deficiencies.

**PART 2 PRODUCTS (Not Applicable)**

**PART 3 EXECUTION**

3.1 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section, it shall be included in the price of Mobilization and of all other work.

**END OF SECTION**

# SECTION 01 55 00

# VEHICULAR ACCESS AND PARKING

## PART 1 GENERAL

### 1.00 GENERAL PROVISIONS

A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

B. **NOTE: ALL CIVIL ENGINEERING RELATED SPECIFICATIONS ARE LOCATED IN THE TECHNICAL DRAWINGS PACKAGE AND ARE TO PREVAIL. ANY AND ALL SPECIFICATIONS IN SECTIONS HEREIN ARE TO BE SECONDARY OR SUPPLIMENTARY TO ANY SPECIFICATION REQUIREMENTS IN THE CIVIL ENGINEER'S TECHNICAL DRAWINGS.**

### 1.01 REQUIREMENTS INCLUDED

A. Provide and maintain vehicular access to site and within site to provide uninterrupted access:

1. To temporary construction facilities, storage, and work areas.
2. For use by persons and equipment involved in construction of Project.
3. For use by emergency vehicles.

B. Areas on job site, including vehicle parking will be assigned by the Owner.

### 1.02 RELATED REQUIREMENTS

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 01 31 00, PROJECT MANAGEMENT AND COORDINATION.
2. Section 01 50 00, TEMPORARY FACILITIES AND CONTROLS.
3. Section 3110 00, SITE CLEARING, Clearing, and grubbing.
4. Section 31 20 00, EARTH MOVING, Establishment of subgrade elevations.

### 1.03 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. Florida Department of Transportation (FDOT):

| | |
|---|---|
| Specifications | Standard Specifications for Road and Bridge Construction |

2. City of Fort Lauderdale Department of Transportation (CFDOT):

| | |
|---|---|
| Specifications | Standard Specifications |

**1.04 ON-SITE ROADS AND PARKING AREAS.**

A. Maintain traffic areas free as possible of excavated materials, construction equipment, Products, snow, ice, and debris.

B. Keep fire hydrants and water control valves free from obstruction and accessible for use.

**PART 2 PRODUCTS**

**2.01 BASE AND TOPPING MATERIALS**

A. For temporary construction which will be removed when no longer needed for construction purposes: To Contractor option.

B. For earthwork and topping which will become a permanent part of the Work: Respective sections of Specifications.

**2.02 DUST CONTROL**

A. Water and calcium chloride for roadway dust control shall conform to FDOT Standard Specifications.

**PART 3 EXECUTION**

3.01 PREPARATION

A. Clear areas required for access roads and parking areas.

B. Fill, compact, and grade areas as necessary to provide suitable support for vehicular traffic under anticipated loadings.

C. Provide for surface drainage of facilities and surrounding areas.

1. Provide and operate temporary pumps.

**3.02 CONSTRUCTION**

A. Construction methods for temporary facilities to be removed when no longer needed: To Contractor's option to provide the required results.

B. For work which will become a part of permanent Work, comply with respective sections of Specifications for preparation and construction.

**3.03 MAINTENANCE**

A. Maintain access drive in a sound, clean condition.

1. Repair or replace any portions damaged during progress of construction work.

**3.04 DUST CONTROL**

A. Contractor shall be responsible for dust control during all construction operations. During the progress of the work, the Contractor shall conduct his operations and maintain the area of his activities including sweeping and sprinkling of streets as necessary, so as to minimize the creation and dispersion of dust. If the Architect decides that it is necessary to use calcium chloride for more effective dust control, the Contractor shall furnish and spread calcium chloride as directed. Methods and materials for dust control shall be as approved by the Architect.

**3.05 REMOVAL**

A. Completely remove temporary materials and construction when construction needs can be met by use of permanent installation.

1. Remove and dispose of compacted materials to depths required by various conditions to be met in completed Work.

B. Restore areas to original or to specified conditions at completion of Work.

**END OF SECTION**

# SECTION 01 55 26

# TRAFFIC CONTROL

## PART 1 GENERAL

### 1.00 GENERAL PROVISIONS

A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

B. **NOTE: ALL CIVIL ENGINEERING RELATED SPECIFICATIONS ARE LOCATED IN THE TECHNICAL DRAWINGS PACKAGE AND ARE TO PREVAIL. ANY AND ALL SPECIFICATIONS IN SECTIONS HEREIN ARE TO BE SECONDARY OR SUPPLIMENTARY TO ANY SPECIFICATION REQUIREMENTS IN THE CIVIL ENGINEER'S TECHNICAL DRAWINGS.**

### 1.01 REQUIREMENTS INCLUDED

A. Provide, operate, and maintain temporary equipment, services, and personnel, with traffic control and protective devices, as required to expedite vehicular traffic flow on haul routes, at site entrances, at on-site access roads, and parking areas during construction.

1. Maintain unobstructed access to fire hydrants and other access routes.
2. Provide open fire lane maintained throughout the construction period to provide uninterrupted access to Project site; include lighting of access lane. Lane shall be approved by local fire chief.
3. Provide police detail and traffic control at designated project entrances and exits during any and all hauling and heavy traffic operations.

B. Remove temporary equipment and facilities when no longer required, restore grounds to original, or specified conditions.

### 1.02 RELATED REQUIREMENTS

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 01 31 00, PROJECT MANAGEMENT AND COORDINATION.
2. Section 01 5 000, TEMPORARY FACILITIES AND CONTROLS.
3. Section 01 55 00, VEHICULAR ACCESS, AND PARKING.

### 1.03 REFERENCED STANDARDS

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. Florida Department of Transportation (FDOT):

| | |
|---|---|
| Specifications | Standard Specifications for Road and Bridge Construction |

2. City of Fort Lauderdale Department of Transportation (CFDOT):

| | |
|---|---|
| Specifications | Standard Specifications |

## 1.04 TRAFFIC CONTROL

A. Provide traffic control required to direct and maintain an orderly flow of traffic in all areas under Contractor's control or affected by Contractor's operations.

B. Provide traffic control and directional signs, mounted on barricades or standard posts:

1. At each change of direction of a roadway and at each crossroad.
2. At detours.
3. At parking areas.

## 1.05 POLICE DETAILS

A. If required by local authorities, provide qualified police detail when construction operations encroach on city traffic lanes and at designated project entrance/exit during any and all hauling and heavy traffic operations.

## 1.06 CONSTRUCTION PARKING CONTROL

A. Control vehicular parking to preclude interference with public traffic or parking, access by emergency vehicles, Owner's operations, or construction operations. Locate parking for construction vehicles at locations approved by the Owner and Architect.

B. Monitor parking of construction personnel's private vehicles:

1. Maintain free vehicular access to and through parking areas.
2. Prohibit parking on or adjacent to access roads, or in nondesignated areas.

## 1.07 HAUL ROUTES

A. Consult with governing authorities, establish public thoroughfares which will be used as haul routes and site access.

B. Confine construction traffic to designated haul routes.

C. Provide traffic control at critical areas of haul routes to expedite traffic flow and to minimize interference with normal public traffic.

D. The Contractor shall not close or obstruct any portion of any street, public or private, without obtaining permits therefore from the proper authorities. If any street or private way shall be rendered unsafe by the Contractor's operations, the Contractor shall make such repairs or provide such temporary ways or guards as shall be acceptable to the governing authority.

E. The Contractor shall conduct the work at all times so that the abutters shall have access to their property. When public or private property is isolated by the temporary closure of a road, the Contractor shall be responsible for providing such safe means of access to a public way.

## PART 2 PRODUCTS

### 2.01 SAFETY CONTROLS AND SAFETY SIGNING

A. Safety controls and safety signing for construction operations shall conform to the relevant provisions of FDOT Standard Specifications and CFDOT Standard Specifications.

## PART 3 EXECUTION

**Not Used.**

**END OF SECTION**

# SECTION 01560 – TEMPORARY CONTROLS

## PART 1 GENERAL

### 1.1 REQUIREMENTS INCLUDED

A. Provide and maintain methods, equipment, and temporary construction, as necessary, to provide controls over environmental conditions at the construction site and related area under CONTRACTOR's control; remove physical evidence of temporary facilities at completion of work.

### 1.2 RELATED REQUIREMENTS

A. All applicable sections of the Specifications.

B. Conditions of the Contract.

### 1.3 NOISE CONTROL

A. Provide all necessary requirements for noise control during the construction period.

a. Noise procedures shall conform to all applicable OSHA requirements and local ordinances having jurisdiction on the work.

b. Noise levels during nighttime hours shall not exceed 55 db measured at the property line of a residence.

### 1.4 DUST CONTROL

A. Provide positive methods and apply dust control materials to minimize raising dust from construction operations and provide positive means to prevent air-borne dust from dispersing into the atmosphere.

### 1.5 WATER CONTROL

A. Provide methods to control surface water to prevent damage to the project, the site, or adjoining properties.

a. Control fill, grading and ditching to direct surface drainage away from excavations, pits, tunnels and other construction areas; and to direct drainage to proper runoff.

B. Provide, operate and maintain hydraulic equipment of adequate capacity to control surface and water.

C. Dispose of drainage water in a manner to prevent flooding, erosion, or other damage to any portion of the site or to adjoining areas.

### 1.6 PEST CONTROL

A. Provide pest control as necessary to prevent infestation of construction or

storage area.

a. Employ methods and use materials which will not adversely affect conditions at the site or on adjoining properties.

b. Should the use of pesticides be considered necessary, submit an informational copy of the proposed program to OWNER with a copy to ENGINEER. Clearly indicate:

i. The area or areas to be treated.

ii. The pesticide to be used, with a copy of the manufacturer's printed instructions.

iii. The pollution preventative measures to be employed.

B. The use of any pesticide shall be in full accordance with the manufacturer's printed instructions and recommendations.

1.7 RODENT CONTROL

A. Provide rodent control as necessary to prevent infestation of construction or storage area.

a. Employ methods and use materials, which will not adversely affect conditions at the site or on adjoining properties

b. Should the use of rodenticide be considered necessary, submit an informational copy of the proposed program to OWNER with a copy to OWNER's Representative. Clearly indicate:

i. the area or areas to be treated.

ii. the rodenticide to be used, with a copy of the manufacturer's printed instructions.

iii. the pollution preventative measures to be employed.

B. The use of any rodenticide shall be in full accordance with the manufacturer's printed instructions and recommendations.

1.8 DEBRIS CONTROL

A. Maintain all areas under CONTRACTOR's control free of extraneous debris.

B. Initiate and maintain a specific program to prevent accumulation of debris at construction site, storage and parking area, or along access roads and haul routes.

a. Provide containers for deposit of debris as specified in Section 01710 - Cleaning.

b. Prohibit overloading of trucks to prevent spillage on access and haul routes.

c. Provide periodic inspection of traffic areas to enforce requirements.

C. Schedule periodic collections and disposal of debris as specified in Section 01710 - Cleaning.

a. Provide additional collections and disposal of debris whenever the periodic schedule is to prevent accumulation.

1.9 POLLUTION CONTROL

A. Provide methods, means and facilities required to prevent contamination of soil, water or atmosphere by the discharge of noxious substances from construction operations.

B. Provide equipment and personnel, perform emergency measures required to contain any spillage, and to remove contaminated soils or liquids.

a. Excavate and dispose of any contaminated earth off-site and replace with suitable compacted fill and topsoil.

C. Take special measures to prevent harmful substances from entering public waters.

a. Prevent disposal of wastes, effluents, chemicals, or other such substances adjacent to streams or in sanitary or storm sewers.

D. Provide systems for control of atmospheric pollutants.

a. Prevent toxic concentrations of chemicals.

b. Prevent harmful dispersal of pollutants into the atmosphere.

1.10 EROSION CONTROL

A. Plan and execute construction and earthwork, by methods to control surface drainage from cuts and fills, and from borrow and waste disposal areas to prevent erosion and sedimentation.

a. Hold the areas of bare soil exposed at one time to a minimum

b. Provide temporary control measures such as berms, dikes and drains.

c. Provide silt screens as required preventing surface water contamination.

B. Construct fills and waste areas by selective placement to eliminate surface silts or clays, which will erode.

C. Periodically inspect earthwork to detect any evidence of the start of erosion, apply corrective measures as required to control erosion.

D. All erosion control procedures must comply with the National Pollutant Discharge Elimination System (NPDES).

1.11 TEMPORARY TREE AND PLANT PROTECTION

GENERAL PROVISIONS

A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

WORK INCLUDED

A. Protection of existing trees and plants from damage as a result of the Contractor's operations including, but not limited to:

Tree protection fencing.
Root pruning and construction pruning.
Fencing of areas designated for tree removals by the Owner.

B. Refer to “Tree Protection and Relocation Notes” included on the Drawings.

RELATED REQUIREMENTS

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

Section 02200, SITE PREPARATION.
Section 311300, SELECTIVE TREE REMOVAL AND TRIMMING’ Includes stump removal of trees removed by the Owner in designated fenced areas.
Section 312300, SITE EXCAVATING, BACKFILLING ANDCOMPACTING: Excavation and backfill.
Section 329300, PLANTING: New plant material.
Section 329600, TRANSPLANTING.

REFERENCED STANDARDS

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

American National Standards Institute (ANSI): Z133.1

Safety Requirements for Pruning, Trimming, Repairing, Maintaining and

Removing Trees, and for Cutting Brush.

International Society of Arboriculture (ISA): Guide for Establishing Values of Trees and Other Plants

National Arborist Association (NAA): Ref. 1
Pruning Standards for Shade Trees

SUBMITTALS

B. Prepare and submit drawings indicating the extent of tree protection fencing required.

C. Proposed methods, and schedule for effecting tree and plant protection shall be submitted for approval.

D. Proposed methods, materials, and schedule for root pruning, construction pruning, and tree fertilization by Certified Arborist shall be submitted for approval.

E. Certified Arborist Qualifications shall be submitted for Architect's review and approval.

QUALITY ASSURANCE

A. Work of this section shall be completed by a professional ISA Certified Arborist with a minimum five years experience, who has successfully completed an exam and education program equal to the International Society of Arboriculture (ISA) Certification Program, sponsored by the International Society of Arboriculture 2009, P.O. Box 3129, Champaign, IL 61826 (217) 355-9411; Email: isa@isa-arbor.com.

B. Arborist shall have the following minimum qualifications:

a. Membership in:
   a. NAA – National Arborist Association
   b. ISA – International Society of Arborists
b. Meet state requirements for insurance.
c. Licenses for application and use of pesticides.

DAMAGE PENALTIES

A. Certain specimen trees within the construction areas and in other key locations will be identified by the Owner and the Architect, and marked with red tags. Loss of any of these trees will result in fines assessed at $10,000 per tree. Damage to all other trees on the property will be assessed at the rate of $200 per inch caliper of the tree.

B. A fine of $1,000 will be levied against the Contractor for each incident of construction inside tree protection areas.

C. Damages to trees, shrubs, and other vegetation will be assessed by the Architect and Owner in accordance with the ISA Guide.

D. Trees or roots visibly damaged will cause the Owner to withold from the Contractor an assessed amount conforming to the requirements stipulated above for a period of two years. After that period the impact of the damage to any tree will be assessed accordingly.

E. If any trees or shrubs designated to be saved are damaged and replacement is required, a number and diameter of trees or shrubs of the same species and variety, as specified by the Owner and Architect, shall be furnished and planted by the Contractor. The total inch diameter of the replacement trees or shrubs shall equal the diameter of the tree or shrub to be replaced.

## PART 2 PRODUCTS

2.1 TREE PROTECTION FENCING

A. Tree protection fencing, including fencing of areas designated for tree removals by the Owner, shall be the following:

1. Polyethylene mesh fencing, chain link fencing, or other Owner approved material; height as indicated on the Drawings.
2. Fabric shall be fluorescent orange, high density polyethylene 1-1/2 in. square mesh.
3. Stakes shall be pressure treated pine.

B. Stakes for fencing shall be driven into the ground, except above utility locations where surface anchors shall be used. Posts shall be spaced 16 ft. on center maximum.

C. For fencing within the drip line of trees, surface mounted post anchors may be acceptable. Review with Architect and arborist and obtain written approval prior to installing. Post installation shall not damage tree root systems.

2.2 ROOT PRUNING

A. Peat moss and mulch materials shall be as specified under Section 329300, PLANTING.

B. Liquid fertilizer to be applied to root pruned and construction pruned trees shall be Peters M 77 Sequestered-Chelated Soluble Fertilizer manufactured by W.R. Grace and Co., Cambridge, MA 02140, Gold Start Liquid Fertilizer, manufactured by Nutra-Flo Company, 1919 Grand Ave, Sioux City, IA 51106-5708; Phone: 712-277-2011; 800-831-4815; Fax: 712-279-1946; Agro- Culture Liquid Fertilizer, manufactured by Agro-Culture Liquid Fertilizers, 3055 W. M-21, P.O. Box 150, St. Johns, Michigan 48879; 1-800-678-9029, or approved equal. Liquid fertilizer shall be approved by Certified Arborist.

C. Dormant oil spray shall be a dormant miscible spray equal to Sunspray, Scalecide, or Volck

Oil.

D. Insecticide shall be Isotox manufactured by Ortho; QuickPRO, manufactureed by Monsanto; LESCO Sevin Brand SL, #019106, manufactured by LESCO, or approved equal. Insecticide shall be approved by Certified Arborist.

## PART 3 EXECUTION

### 3.1 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section; it shall be included in the price of all other work.

### 3.2 PROTECTION FOR EXISTING TREES TO BE PRESERVED:

A. All trees to be preserved on the property shall be protected against damage from construction operations.

1. Includes associated understory.

B. Only those trees located within the limits of improvements to be constructed as indicated, shall be removed.

1. All trees to remain shall be flagged for review after the location of improvements to be constructed are staked in the field.
2. Any tree to be removed shall be reviewed by the Architect and Owner for approval prior to removal.
3. Trees to be preserved are represented by a solid line. Trees to be removed are represented by a dashed or ghosted line. Trees to be planted are graphically differentiated from existing trees.
4. Obtain approval of installation of tree barricade fencing from Owner and Architect prior to the initiation of any removal of vegetation and construction.

C. Erect fencing and armor protection prior to beginning any clearing, demolition or construction activity, and unless otherwise instructed, maintain in place until construction is completed.

1. Tree protection barricade shall be erected at the edge of the dripline where possible; in extreme circumstances and with the approval of the Architect, fencing may be located at the edge of the root protection zone.
   a. For trees 10-inch caliper and less, the minimum distance the barrier shall be erected is ten (10) feet from the trunk of tree or clump of trees.
2. Trees immediately adjacent to and within one hundred feet (100) of any construction activities are to be protected by barricade fencing; subject to approval of the Architect and Owner.
3. Trees exposed to construction activity within the dripline or within twenty-five (25) feet of any construction activity are to have trunks protected

with tree armor in addition to barricade fencing.

4. The tree protection barricade shall be placed before any excavating or grading is begun and maintained in repair for the duration of the construction work unless otherwise directed.
5. No material shall be stored or construction operation shall be carried on within the tree protection barricade.
6. Tree protection barricade shall remain until all work is completed.
7. Remove tree protection barricade at commencement of finish grading.
8. Remove tree armor immediately prior to Substantial Completion.

D. Protect tree trunk with tree armor to a height of 8' or to the limits of lower branching (when exposed to construction activity within the drip line) with 2x4's butted side to side completely around trunk.

1. Wire wrap do not nail, around trees.

DI. Protect trees that are to remain, whether within barricade fencing or not, from the following:

1. Compaction of root area by equipment or material storage; construction materials shall not be stored closer to trees than the farthest extension of their limbs (dripline).
2. The proposed finished grade within the root protection zone of any preserved tree shall not be raised or lowered more than three (3) inches.
   a. Retaining methods can be used to protect and/or provide lateral support to the area outside the root protection zone.
3. Trunk damage by moving equipment, material storage, nailing or bolting.
4. Strangling by tying ropes or guy wires to trunks or large branches.
5. Poisoning by pouring solvents, gas, paint, etc., on or around trees and roots.
6. Cutting on roots by excavating, ditching, etc.
   a. Prior to excavation within the tree drip lines or the removal of trees adjacent to other trees that are to remain, make a clean cut between the disturbed and undisturbed root zones with a rock saw or similar equipment to minimize root damage.
   b. Refer to EXCAVATION AROUND TREES for additional information.
7. Damage of branches by improper pruning.
8. Drought from failure to water or by cutting or changing normal drainage pattern past roots. Contractor shall provide means as necessary to ensure positive drainage.
9. Changes of soil pH factor by disposal of lime base materials such as concrete, plaster, lime treatment at pavement subgrade, etc. When installing concrete adjacent to the root zone of a tree, use a minimum 6 mil. plastic vapor barrier behind the concrete to prohibit leaching of lime into the soil.
10. Do not cut roots 3/4" in diameter or over without approval of Owner’s Representative. All excavation and earthwork within the PRZ of trees

shall be done by hand.

11. Protect all existing trees near areas to be stabilized from underground contaminations by placing a 6 mil. Plastic film barrier along exposed vertical cut extending a minimum 12" into undisturbed subgrade below depth of stabilization.
12. No vehicular traffic shall occur within the drip line of any tree; including parking of vehicles.
13. No soil shall be spread, spoiled or otherwise disposed of under any tree within the PRZ.

F. Any damage done to existing tree crowns or root systems shall be repaired by the Arborist to the satisfaction of the Architect and Owner's Representative.

1. Broken branches shall be cut cleanly.
2. Any roots cut shall be cut cleanly with a saw other means approved by the Architect and Owner's Representative.

G. Damages to trees caused through negligence of Contractor or his employees will be assessed by Owner and Project Arborist as described in Paragraph 1.06.

3.3 PROTECTED ROOT ZONE:

A. The PROTECTED ROOT ZONE (PRZ).

1. No disturbance shall occur closer to the tree than one-half the radius of the PRZ or within five (5) feet of the tree whichever is greater.

3.4 PROTECTED ROOT ZONE IMPACTS:

A. Those trees to remain which have some encroachment on their protected root zone shall have the following maximum allowable impacts:

1. Minimum Protection Criteria 'A': No disturbance of natural grade, e.g. trenching or excavation, can occur closer to the tree than one-half the radius of the PRZ or within five (5) feet of the tree whichever is greater.
2. Minimum Protection Criteria 'B': No cut or fill greater than three (3) inches will be located closer to the tree trunk than ½ the PRZ radius distance.

B. Trees impacted shall have a minimum of a six (6) inch layer of mulch placed and maintained over the root protection zone and the undisturbed area within the dripline.

1. Immediate pruning and fertilization shall occur per the pruning and fertilization sections of this specification.
2. Provide water in a slow drip manner to impacted trees as approved by the Architect and Owner's Representative.
3. Provide water to apply equivalent to 1 inch once per week to deeply soak in over the area within the dripline of the tree during periods of

hot, dry weather.

4. Spray tree crowns periodically to reduce dust accumulation on the leaves.

## 3.5 EXCAVATING AROUND TREES

A. Excavate within the dripline of trees only where required and when absolutely necessary.

1. Any excavation within the PRZ of trees shall be under the direction of the Arborist.
2. Arborist shall be at site at all times while excavation is occurring within the PRZ.
3. Air spade all removals within the PRZ.
4. Refer to PROTECTED ROOT ZONE.

B. When excavating for new construction is required within the PRZ, air spade and hand excavate to minimize damage to root systems.

1. Use narrow tine spading forks and comb soil to expose roots.
2. Relocate roots back into backfill areas wherever possible.
3. If large main lateral roots are encountered, expose beyond excavation limits as required to bend and relocate without breaking.
4. If root relocation is not practical, clean cut roots approximately three (3) inches back from new construction.

C. Where existing grade is above new finish grade, carefully excavate within the dripline to the new finish grade.

1. Carefully hand excavate an additional six (6) inches below the finish grade.
2. Use narrow tine spading forks to comb the soil to expose the roots, and prune the exposed root structure as recommended by the Arborist.
3. Keep the exposed roots damp.
4. Treat the cut roots as specified and as recommended by the Arborist.
5. After pruning and treatment of the root structure is complete, backfill to finish grade with eight (8) inches of approved plant mix, or structural soil.

D. Where noted on plan, use airspade to expose roots for required cutting to accommodate hardscape elements. Architect to verify all cuts prior to proceeding.

E. Temporarily support and protect roots against damage until permanently relocated and covered with recommended landscape material.

## 3.6 INSTALLATION OF FENCING

A. Prior to start of demolition work and clearing and grubbing operations, tree

protection fencing shall be installed in accordance with the following:

1. Fencing shall be installed at the tree protection areas indicated on the Drawings.
2. Fencing shall be installed a minimum of 15 ft. beyond the drip line of trees to be protected, unless otherwise approved by the Architect.

B. Tree protection fencing to be installed over utility locations shall be installed using surface anchors. No poles or stakes shall be driven into the ground at these locations.

3.7 ROOT PRUNING

A. Where construction will within drip line of existing trees designated to remain, roots shall be pruned.

B. All root pruning shall be done by Certified Arborist only. Air spade is the preferred tool for root pruning. Trenching, vibrating plow, and stump grinding are NOT suitable means for root pruning.

C. Roots greater than 1 in. diameter shall be pruned by means of a hand saw, or other approved means.

D. Install root protection measures as prescribed by Certified Arborist.

3.8 CONSTRUCTION PRUNING

A. Construction pruning shall conform to NAA Ref.1 for Class IV - Crown Reduction Pruning. Work shall conform to the requirements of ANSI Z133.1, and shall be reviewed in the field with the Architect and Certified Arborist prior to start of work.

3.9 FERTILIZATION AND INSECT SPRAYING

A. Root pruned and construction pruned tree shall be treated with liquid fertilizer, dormant oil spray, and insecticide as prescribed by Certified Arborist.

B. Liquid fertilizer shall be applied at a rate recommended by the manufacturer and as required by NAA Ref. 2.

C. Dormant oil spray shall be applied in early spring before buds begin to swell at a rate recommended by the manufacturer.

D. Insecticide spray shall be applied twice to root pruned trees following application of dormant oil spray. Spray insecticide at rates recommended by spray manufacturer at intervals appropriate for effective insect control.

3.10 REMOVAL OF PROTECTION

A. All protection shall remain in place throughout the construction period. Remove protection devices only after written permission has been granted by the Architect.

**END OF SECTION**

# SECTION 01 56 39

# TEMPORARY TREE AND PLANT PROTECTION

## PART 1 GENERAL

### 1.00 GENERAL PROVISIONS

A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

B. Should this Section specify requirements in conflict with the Construction Drawings package, Construction Drawings package shall govern.

### 1.01 SUMMARY

A. Protection of existing trees and plants from damage as a result of the Construction operations including, but not limited to:

1. Tree protection fencing.
2. Root pruning and construction pruning.
3. Fencing of areas designated for tree removals by the Owner.

B. Refer to “Tree Protection and Relocation Notes” included on Drawing Sheet LD-101.

### 1.02 RELATED REQUIREMENTS

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 31 25 00, EROSION AND SEDIMENT CONTROL: Silt fencing.
2. Section 31 10 00, SITE CLEARING: Clearing and grubbing.
3. Section 31 13 00, SELECTIVE TREE REMOVAL AND TRIMMING’ Includes stump removal of trees removed by the Owner in designated fenced areas.
4. Section 31 20 00, EARTH MOVING: Excavation and backfill.
5. Section 31 23 00, EARTHWORK FOR BUILDINGS.
6. Section 32 93 00, PLANTING: New plant material.
7. Section 32 96 00, TRANSPLANTING.

### 1.03 REFERENCED STANDARDS

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. American National Standards Institute (ANSI):

   Z133.1 - Safety Requirements for Pruning, Trimming, Repairing, Maintaining and Removing Trees, and for Cutting Brush.

2. International Society of Arboriculture (ISA):

   Guide for Establishing Values of Trees and Other Plants

3. National Arborist Association (NAA):

   Ref. 1- Pruning Standards for Shade Trees

## 1.04 ACTION SUBMITTALS

A. Prepare and submit drawings indicating the extent of tree protection fencing required and other materials required.

B. Proposed methods, and schedule for effecting tree and plant protection shall be submitted for approval.

C. Proposed methods, materials, and schedule for root pruning, construction pruning, and tree fertilization by Certified Arborist shall be submitted for approval.

D. Certified Arborist Qualifications shall be submitted for Architect’s review and approval.

E. Prepare Shop Drawings that include plans, elevations, sections, and locations of protection-zone fencing and signage, showing relation of equipment-movement routes and material storage locations with protection zones.

F. Certification: From arborist, certifying that trees indicated to remain have been protected during construction according to recognized standards and that trees were promptly and properly treated and repaired when damaged.

G. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.

H. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.

## 1.05 QUALITY ASSURANCE

A. Work of this section shall be completed by a professional ISA Certified Arborist with a minimum five years experience, who has successfully completed an exam and education program equal to the International Society of Arboriculture (ISA) Certification Program, sponsored by the International Society of Arboriculture 2009, P.O. Box 3129, Champaign, IL 61826 (217) 355-9411; Email: isa@isa-arbor.com.

B. Arborist shall have the following minimum qualifications:

1. Licensed Arborist in Jurisdiction where project is located.
2. Current member of ASCA or registered Consulting Arborist as designated by ASCA.
3. Licenses for application and use of pesticides.

## 1.06 FIELD CONDITIONS

A. The following practices are prohibited within protection zones:

1. Storage of construction materials, debris, or excavated material.
2. Moving or parking vehicles or equipment.
3. Foot traffic.
4. Erection of sheds or structures.
5. Impoundment of water.
6. Excavation or other digging unless otherwise indicated.
7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
8. Do not direct vehicle or equipment exhaust toward protection zones.
9. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

## 1.07 DAMAGE PENALTIES

A. Certain specimen trees within the construction areas and in other key locations will be identified by the Owner and the Architect and marked with red tags. Loss of any of these trees will result in fines assessed at $10,000 per tree. Damage to all other trees on the property will be assessed at the rate of $200 per inch caliper of the tree.

B. A fine of $1,000 will be levied against the Contractor for each incident of construction inside tree protection areas.

C. Damages to trees, shrubs, and other vegetation will be assessed by the Architect and Owner in accordance with the ISA Guide.

D. Trees or roots visibly damaged will cause the Owner to withhold from the Contractor an assessed amount conforming to the requirements stipulated above for a period of two years. After that period, the impact of the damage to any tree will be assessed accordingly.

E. If any trees or shrubs designated to be saved are damaged and replacement is required, a number and diameter of trees or shrubs of the same species and variety, as specified by the Owner and Architect, shall be furnished, and planted by the Contractor. The total inch diameter of the replacement trees or shrubs shall equal the diameter of the tree or shrub to be replaced.

## PART 2 PRODUCTS

## 2.01 TREE PROTECTION FENCING

A. Tree protection fencing, including fencing of areas designated for tree removals by the Owner, shall be the following:

1. Polyethylene mesh fencing, chain link fencing, or other Landscape Architect approved material; height as indicated on the Drawings.
2. Fabric shall be fluorescent orange, high density polyethylene 1-1/2 in. square mesh.
3. Stakes shall be pressure treated pine.

B. Stakes for fencing shall be driven into the ground, except above utility locations where surface anchors shall be used. Posts shall be spaced 16 ft. o.c. maximum.

C. For fencing within the drip line of trees, surface mounted post anchors may be acceptable. Review with Architect and arborist and obtain written approval prior to installing. Post installation shall not damage tree root systems.

D. Protection-Zone Signage: Shop-fabricated, rigid plastic or metal sheet with attachment holes prepunched and reinforced; legibly printed with nonfading lettering.

E. Backfill Soil: Stockpiled soil mixed with planting soil of suitable moisture content and granular texture for placing around tree; free of stones, roots, plants, sod, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth.

1. Mixture: Well-blended mix of two parts stockpiled soil to one part planting soil. Submit sample for approval.

F. Organic Mulch: Free from deleterious materials and suitable as a top dressing for trees and shrubs, consisting of one of the following:
1. Mixture: Well-blended mix of two parts stockpiled soil to one part planting soil. Submit sample for approval

# PART 3 EXECUTION

## 3.01 PROTECTION FOR EXISTING TREES TO BE PRESERVED:

A. Fences shall surround the tree or clusters of trees; shall be located at the outermost limits of the tree branches (dripline); and shall be maintained throughout the construction project in order to prevent the following.

1. Soil compaction in the root zone area resulting from vehicular traffic or storage of equipment or materials.
2. Root zone disturbances due to grade changes (greater than 6 inches cut or fill) or trenching not reviewed and authorized by the owner representative.
3. Wounds to exposed roots, trunk or limbs by mechanical equipment.
4. Other activities detrimental to trees such as chemical storage, concrete truck cleaning, and fires.

B. Exceptions to installing fences at tree driplines may be permitted in the following cases.

1. Where permeable paving is to be installed, erect the fence at the outer limits of the permeable paving area.
2. Where trees are close to proposed buildings, erect the fence no closer than 6 feet to the building.
3. Where there are severe space constraints due to tract size, or other special requirements, contact the owner representative to discuss alternatives.

### 3.02 EXAMINATION

A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion- and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.

## 3.03 PREPARATION

A. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

B. Tree-Protection Zones: Mulch areas inside tree-protection zones and other areas indicated. Do not exceed indicated thickness of mulch.

1. Apply 2-inch (50-mm) uniform thickness of organic mulch unless otherwise indicated. Do not place mulch within 6 inches (150 mm) of tree trunks.

## 3.04 PROTECTION ZONES

A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones in a manner that will prevent people from easily entering protected areas except by entrance gates.

1. Chain-Link Fencing: Install to comply with ASTM F 567 and with manufacturer's written instructions.
2. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Landscape Architect.
3. Access Gates: Install where indicated.

B. Protection-Zone Signage: Install protection-zone signage in visibly prominent locations in a manner approved by Architect.

C. Maintain protection zones free of weeds and trash.

D. Maintain protection-zone fencing and signage in good condition as acceptable to Architect and remove when construction operations are complete, and equipment has been removed from the site.

## 3.05 EXCAVATION

A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Section 312000 "Earth Moving" unless otherwise indicated.

B. Trenching within Protection Zones: Where utility trenches are required within protection zones, excavate under or around tree roots by hand or with air spade, or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning.

C. Do not allow exposed roots to dry out before placing permanent backfill.

## 3.06 ROOT PRUNING

A. Prune tree roots that are affected by temporary and permanent construction. Prune roots as directed by Arborist.

B. Root Pruning at Edge of Protection Zone: Prune tree roots by cleanly cutting all roots to the depth of the required excavation.

C. Root Pruning within Protection Zone: Clear and excavate by hand or with air spade to the depth of the required excavation to minimize damage to tree root systems. If excavating by hand, use narrow-tine spading forks to comb soil to expose roots. Cleanly cut roots as close to excavation as possible.

## 3.07 CROWN PRUNING

A. Prune branches that are affected by temporary and permanent construction. Prune

branches as directed by arborist.

1. Prune to remove only broken, dying, or dead branches unless otherwise indicated. Do not prune for shape unless otherwise indicated.
2. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system.

3. Pruning Standards: Prune trees according to ANSI A300.

B. Cut branches with sharp pruning instruments; do not break or chop.

C. Do not paint or apply sealants to wounds.

D. Chip removed branches and dispose of off-site.

## 3.08 REGRADING

A. Lowering Grade: Where new finish grade is indicated below existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

B. Raising Grade: Where new finish grade is indicated above existing grade around trees, slope grade beyond the protection zone. Maintain existing grades within the protection zone.

C. Minor Fill within Protection Zone: Where existing grade is 2 inches (50 mm) or less below elevation of finish grade, fill with backfill soil. Place backfill soil in a single uncompacted layer and hand grade to required finish elevations.

## 3.09 FIELD QUALITY CONTROL

A. Inspections: Engage a qualified arborist to direct plant-protection measures in the vicinity of trees, shrubs, and other vegetation indicated to remain and to prepare inspection reports.

## 3.10 REPAIR AND REPLACEMENT

A. General: Repair or replace trees, shrubs, and other vegetation indicated to remain or to be relocated that are damaged by construction operations, in a manner approved by Architect.

1. Perform repairs of damaged trunks, branches, and roots within 24 hours according to arborist's written instructions.
2. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.

B. Excess Mulch: Rake mulched area within protection zones, being careful not to injure roots. Rake to loosen and remove mulch that exceeds a 2-inch (50-mm) uniform thickness to remain.

## 3.11 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove excess excavated material, displaced trees, trash, and debris and legally dispose of them off Owner's property.

**END OF SECTION**

# SECTION 01570 – TRAFFIC REGULATIONS

## PART 1 GENERAL

### 1.1 REQUIREMENTS INCLUDED

A. Provide, operate and maintain equipment, services and personnel, with traffic control and protective devices, as required to expedite vehicular traffic flow to provide safe and expeditious movement of traffic through and on haul routes, at site entrances, in construction zones, on-site access roads, and parking areas including driving and/or walking public.

B. Remove temporary equipment and facilities when no longer required, restore grounds to original, or specified conditions.

C. The requirements specified herein are in addition to the plan for Maintenance of Traffic as specified in Section 01500.

### 1.2 RELATED REQUIREMENTS

A. All applicable sections of the Specifications.

B. Conditions of the Contract.

### 1.3 TRAFFIC SIGNALS AND SIGNS

A. Provide and operate traffic control and directional signals or signs required to direct and maintain an orderly flow of traffic in all areas under CONTRACTOR's control, or affected by CONTRACTOR's operations.

### 1.4 FLAGPERSON

A. Provide qualified and suitably equipped flag-person when construction operations encroach on traffic lanes, as required for regulation of traffic.

### 1.5 FLARES AND LIGHTS

A. Provide flares and lights during periods of low visibility:

a. To clearly delineate traffic lanes and to guide traffic.

b. For use of flag-person in directing traffic.

B. Provide illumination of critical traffic and parking areas.

a. Maintain free vehicular access to and through parking areas.

b. Prohibit parking on or adjacent to access roads, or in non-designated areas.

1.6 HAUL ROUTES

A. Consult with OWNER and governing authorities, establish public thoroughfares which will be used as haul routes and site access.

B. Confine construction traffic to designated haul routes.

C. Provide traffic control at critical areas of haul routes to expedite traffic flow, to minimize interference with normal public traffic.

1.7 EMERGENCY ACCESS

A. In order to provide protection to the workers and residents, the Contractor shall maintain emergency access to all adjacent properties at all times during construction. If a road is required to be closed to vehicular traffic and the distance of the closure exceeds 150 feet between stabilized surfaces, or prevents access to properties for a distance that exceeds 150 feet, the Contractor shall provide a 10 foot wide stabilized access way on one side of the trench capable of supporting a Fire Truck. Contractor shall also provide stabilized access ways across the trench or un-stabilized area a minimum of 6 feet in width at a spacing not to exceed 100 feet capable of supporting foot traffic. These access ways shall be protected and delineated with lighted barricades or other such devices as approved by the regulatory agency. Both ends of the emergency access way shall be blocked in accordance with the MOT permit approved by the City of Fort Lauderdale and FDOT with signage indicating that this access way is to be used by emergency vehicles only.

No trenches or holes shall be left open after working hours. In the event a trench must be left open after hours, it shall be done so only with the express written permission from the Engineer, and it shall be the Contractor's responsibility to provide proper protection of the open trench or hole as required by the regulatory agency. In addition the Contractor shall provide a security guard at the site whenever the Contractor's personnel are not present, 24 hours per day/ 7 days per week. It shall be the Security Guard's responsibility to protect the open trench or hole from trespassers and to direct emergency personnel on site. The Security Guard shall not have any other responsibilities such as operation pumps or equipment but shall be dedicated to protecting the trench or open hole. The Security Guard shall be equipped with a wireless telephone capable of calling 911 to report an emergency and shall keep that telephone on their person at all times. In addition to this provision the contractor shall maintain trench safety and comply with current OSHA regulations and the Trench Safety Act. The contractor shall maintain and keep all safety barricades, signage, flashers, and detours, in operation condition. A copy of the approved MOT plans, and details, shall be on site at all times.

B. Measurement and payment for security guard services shall be included in the utility pipe installation unit price. Measurement for temporary emergency access ways will be paid for under the specified line item at the unit price described in the bid schedule.

## PART 2 PRODUCTS (Not Applicable)

## PART 3 EXECUTION

3.1 MEASUREMENT AND PAYMENT

A. There shall be no special measurement and payment for work under the section; it shall be included in the lump sum price bid for Maintenance of Traffic.

**END OF SECTION**

**SECTION 01 57 13**

**TEMPORARY EROSION AND SEDIMENT CONTROL**

## PART 1 GENERAL

### 1.00 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

B. **NOTE: ALL CIVIL ENGINEERING RELATED SPECIFICATIONS ARE LOCATED IN THE TECHNICAL DRAWINGS PACKAGE AND ARE TO PREVAIL. ANY AND ALL SPECIFICATIONS IN SECTIONS HEREIN ARE TO BE SECONDARY OR SUPPLIMENTARY TO ANY SPECIFICATION REQUIREMENTS IN THE CIVIL ENGINEER'S TECHNICAL DRAWINGS.**

### 1.01 SUMMARY

A. This Section specifies equipment and materials for an erosion and sediment control program for minimizing erosion and siltation during the construction phase of the project. The erosion and sediment control provisions detailed on the Drawings and specified herein are the minimum requirements for an erosion control program. The Contractor shall provide additional erosion and sediment control materials and methods as required to affect the erosion and siltation control principles specified herein.

### 1.02 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are no for sitework,

1. Section 01 50 00, TEMPORARY FACILITIES AND CONTROLS; Fencing, except silt fence.
2. Section 02 41 10, SITE PREPARATION; Clearing and grubbing.
3. Section 31 23 00, EARTHWORK; Excavation and backfill.
4. Section 32 92 00, LAWNS AND GRASSES; Permanent seeding for lawns.

### 1.03 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. Florida Department of Transportation (FDOT):

| | |
|---|---|
| Specifications | Standard Specifications for Road and Bridge Construction |

### 1.04 SUBMITTALS

A. Proposed methods, materials to be employed, and schedule for effecting erosion and

siltation control and preventing erosion damage shall be submitted for approval. Submittals shall include:

1. Proposed methods for effecting erosion and siltation control including 1" = 30' scale plans indicating location of erosion control devices and siltation basins.
2. List of proposed materials including manufacturer's product data.
3. Schedule of erosion control program indicating specific dates from implementing programs in each major area of work.

B. The following samples shall be

submitted:

| Sample | Size |
|---|---|
| Filter Fabric | 12 x 12 in. |

**1.05 WORK WITHIN AND CONTIGUOUS WITH INTRACOASTAL WATERWAY**

A. The Contractor is required to file a Notice of Intent to Use the NPDES Generic Permit for Stormwater Discharge from Large and Small Construction Activities ("Generic Permit") for the work of this Project. All work on this Project must be in strict compliance with the terms of the Generic Permit stated therein. A copy of the Generic Permit and other required Stormwater Pollution Prevention Plan information shall be kept on-site at all times by the Contractor.

**1.06 EROSION CONTROL PRINCIPLES**

A. The following erosion control principles shall apply to the land grading and construction phases:

1. Stripping of vegetation, grading, or other soil disturbance shall be done in a manner which will minimize soil erosion.
2. Whenever feasible, natural vegetation shall be retained and protected.
3. Extent of area which is exposed and free of vegetation and duration of its exposure shall be kept within practical limits.
4. Temporary seeding, mulching, or other suitable stabilization measures shall be used to protect exposed critical areas during prolonged construction or other land disturbance.
5. Drainage provisions shall accommodate increased runoff resulting from modifications of soil and surface conditions during and after development or disturbance. Such provisions shall be in addition to existing requirements.
6. Sediment shall be retained on -site.
7. Erosion control devices shall be installed as early as possible in the construction sequence prior to start of clearing and grubbing operations and excavation work.

B. Cut and fill slopes and stockpiled materials shall be protected to prevent erosion. Slopes shall be protected with erosion protection when erosion exposure period is expected to be greater than seven (7) days.

1. Permanent erosion protection shall be accomplished by seeding with grass and covering with an erosion protection material, as appropriate for prevailing conditions.
2. Temporary erosion protection shall be accomplished by covering an erosion protection material, as appropriate for prevailing conditions.
3. Except where specified slope is indicated on Drawings, fill slopes shall be limited

to a grad e of 4:1 (horizontal: vertical) cut slopes shall be limited to a grade of 4:1.

## 1.07 QUALITY ASSURANCE

A. When applicable, comply with the requirements of Stormwater Pollution Prevention Plan prepared for the Generic Permit, which are incorporated herein by reference, and all other applicable requirements of governing authorities having jurisdiction. The specifications and drawings are not represented as being comprehensive, but rather convey the intent to provide complete slope protection and erosion control for both the Owner's and adjacent property.

1. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil -bearing water runoff or airborne dust to adjacent properties and walkways, according to a sediment and erosion control plan specific to the site, that complies with the Generic Permit or requirements of authorities having jurisdiction, whichever is more stringent.
2. Generic Permit Conditions.

B. Erosion control measures shall be established at the beginning of construction, maintained during the entire period of construction, and modified as needed as construction progresses. On-site areas which are subject to severe erosion, and off-site areas which are especially vulnerable to damage from erosion and/or sedimentation, are to be identified and receive special attention.

C. All land-disturbing activities are to be planned and conducted to minimize the size of the area to be exposed at any one time, and the length of time of exposure.

D. Surface water runoff originating upgrade of exposed areas should be controlled to reduce erosion and sediment loss during the period of exposure.

E. When the increase in the peak rates and velocity of storm water runoff resulting from a land-disturbing activity is sufficient to cause accelerated erosion of the receiving stream bed, provide measures to control both the velocity and rate of release so as to minimize accelerated erosion and increased sedimentation of the stream.

F. All land-disturbing activities are to be planned and conducted so as to minimize off-site sedimentation damage.

G. The Contractor is responsible for cleaning out and disposing of all sediment once the storage capacity of the sediment facility is reduced by one-half.

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

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

# PART 2 PRODUCTS

## 2.01 SILT FENCE

A. Silt Fence: As per the City of Fort Lauderdale Detail 105, included in the plans.

## 2.02 TEMPORARY SEED COVER

A. Seed for temporary cover shall conform to FDOT Specifications Section 981 and the following requirements:

1. Seed mixture and application rate shall be as follows:

| Common Name | Scientific Name | Seed Application Rate lb. per acre |
|---|---|---|
| Bermuda grass | Cynodon dactylon | 10.9 |
| Annual Rye | Lolium multiflorum | 5.0 |

**2.03 MISCELLANEOUS ITEMS**

A. Aggregate for construction entrances, curb inlet protection, and silt dikes shall conform to the details in the plans.

**2.04 FILTER SACK INLET PROTECTION**

A. Filter sack inlet protection shall be as per the detail in the plans .

**PART 3 EXECUTION**

**3.01 SILT FENCE**

A. Silt fence shall be constructed and installed as indicated on the Drawings, prior to start of clearing and grubbing operations.

**3.02 STABILIZED CONSTRUCTION ENTRANCE AND STONE BERMS**

A. Stone size: Use ASTM designation C -33, size No. 2 (1 -1/2" to 2-1/2"). Use crushed stone.

B. Length: As effective, but not less than 50 feet.

C. Thickness: Not less than eight inches.

D. Width: Not less than full width of all points on ingress or egress, but not less than 25 feet.

E. Washing: When necessary, wheels shall be cleaned to remove sediment prior to entrance onto public right -of-way. When washing is required, it shall be done on an area stabilized with crushed stone which drains into an approved sediment trap or sediment basin. All sediment shall be prevented from entering any storm drain, ditch, or watercourse through the use of sandbags, gravel boards or other approved methods.

F. Maintenance: The entrance shall be maintained in a condition which will prevent tracking or flowing of sediment onto public rights -or-way. This may require periodic top dressing with additional stone as conditions demand and repair and/or cleanout of any measures used to trap sediment. All sediment spoiled, dropped, washed, or tracked onto public rights -of-way must be removed immediately.

G. Place crushed stone berms in locations required and as directed. Berms shall have side slopes of 1:3 or less.

H. Inspect stone berms periodically and replace and/or regrade crushed stone as required.

**3.03 TEMPORARY STABILIZATION**

A. Seed for temporary cover shall be spread by the hydroseeding method, utilizing power equipment commonly used for that purpose. Seed, fertilizer, mulch and water shall be mixed and applied to achieve application quantities specified.Material shall be applied in 2 equal applications, with the equipment during the second pass moving perpendicular to direction employed during the first pass. Hydroseeding shall not be done when it is raining or snowing, or when wind velocity exceeds 5 mph.

B. If the results of hydroseeding application are unsatisfactory, the mixture and/or application rate and methods shall be modified to achieve the required results.

C. After the grass has appeared, all areas and parts of areas which fail to show a uniform stand of grass, for any reason whatsoever, shall be reseeded and such areas and parts of areas seeded repeatedly until all areas are covered with a satisfactory growth of grass.

**3.04 INLET PROTECTION (Filter Sacks)**

A. Inlet protection devices shall be installed at all catch basin locations indicated on the Drawings. Filter sacks shall be installed in accordance with manufacturer's recommendations.

1. Maintain filter baskets as required and as follows. Baskets shall be inspected within 24 hours after each significant rainfall or daily during extended periods of precipitation. Repairs shall be made immediately, as necessary, to prevent particles from reaching the drainage system. Sediment deposits shall be removed after each storm event, or more often if the fabric becomes clogged. Clean clogged fabric and repair or replace damaged filter fabric.

B. To install Silt sack in the catch basin, remove the grate; and place the sack in the opening. Hold approximately six inches of the sack outside the frame. This is the area of the lifting straps. Replace the grate to hold the sack in place.

C. When the restraint cord is no longer visible, Silt sack is full and should be emptied.

D. To remove Silt sack, take two pieces of 1” diameter rebar and place through the lifting loops on each side of the sack to facilitate the lifting of Silt sack.

E. To empty Silt sack, place unit where the contents will be collected. Place the rebar through the lift straps (connected to the bottom of the sack) and lift. This will lift Silt sack from the bottom and empty the contents. Clean out and rinse. Return Silt sack to its original shape and place back in the basin.

**3.05 MAINTENANCE AND REMOVAL OF EROSION CONTROL DEVICES**

A. Wetland areas, water courses, and drainage swales adjacent to construction activities shall be monitored twice each month for evidence of silt intrusion and other adverse environmental impacts, which shall be corrected immediately upon discovery.

B. Culverts and drainage ditches shall be kept clean and clear of obstructions during construction period.

C. Erosion Control Dev ices

1. Sediment behind the erosion control device shall be checked twice each month and after each heavy rain. Silt shall be removed if greater than 6 in. deep.
2. Condition of erosion control device shall be checked twice each month or more frequently as required. Damaged and/or deteriorated items shall be replaced. Erosion control devices shall be maintained in place and in effective condition.
3. Hay bales shall be inspected frequently and maintained or replaced as required to maintain both their effectiveness and essentially their original condition. Underside of bales shall be kept in close contact with the earth below at all times, as required to prevent water from washing beneath bales.
4. Sediment shall be removed from the retention ponds at the completion of the Project and periodically during construction. Sediment deposits shall be removed when sediment has accumulated to a depth of 12 in. or as directed.
5. Sediment deposits shall be disposed of off-site, in a location and manner which will not cause sediment nuisance elsewhere.

D. Removal of Erosion Control Devices

1. Erosion control devices shall be maintained until all disturbed earth has been paved or vegetated, at which time they shall be removed. After removal, areas disturbed by these devices shall be regraded and seeded.
2. Erosion control netting shall be kept securely anchored until start of permanent turf construction.
3. Erosion protection material shall be kept securely anchored until acceptance of completed slope or entire Project, whichever is later.

## 3.06 CONCRETE RINSING

A. Clean concrete from transit mix trucks and finishing tools into delineated washout area(s). Excess concrete that cannot be disposed of on-site shall be collected in a watertight lined box and removed from the site by the contractor, as necessary.

B. Sediment from rinsing concrete shall be prevented from entering the storm sewer by protection of the storm sewer or capturing rinse water in settling tank(s).

**END OF SECTION**

## SECTION 01590 – PROJECT SIGN

## PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

A. Contractor shall furnish two **4' x 8'** sign, **below is a sample, not specific to the project**.

B. **Sign shall be made to be weather resistant and on display for entire length of contract.**

C. **Shop drawings must be submitted prior to sign construction.**

D. **The exact style and design of the sign will be provided during the preconstruction meeting.**


B. See Page 2, "Construction Sign Request Form", for information on the sign for this Project.

**END OF SECTION**

## Construction Sign Request Form P11870D

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 |
| --- | --- |
| | |

# SECTION 01 60 00

# PRODUCT REQUIREMENTS

## PART 1 GENERAL

### 1.00 GENERAL PROVISIONS

A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

### 1.01 SUMMARY

A. This Section specifies administrative and procedural requirements for materials and equipment used for the Project.

### 1.02 RELATED REQUIREMENTS

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 01010, SUMMARY.
2. Section 0178, CLOSEOUT PROCEDURES

### 1.03 DEFINITIONS

A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
3. Comparable Product: Product that is demonstrated and approved by Architect through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.

C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications. Submit a comparable product request, if applicable.

**1.03 MATERIAL AND EQUIPMENT INCORPORATED INTO THE WORK**

A. Conform to applicable specifications and standards.

B. Comply with size, make, type and quality specified, or as specifically approved in writing by the Architect.

C. Manufactured and Fabricated Products:

1. Design, fabricate and assemble in accord with the best engineering and shop practices.
2. Manufacture like parts of duplicate units to standard size and gages, to be interchangeable.
3. Two or more items of the same kind shall be identical, by the same manufacturer.
4. Products shall be suitable for service conditions.
5. Equipment capacities, sizes, and dimensions shown or specified shall be adhered to unless variations are specifically approved in writing.

D. Do not use material or equipment for any purpose other than that for which it is designed or is specified.

**1.04 WORKMANSHIP**

A. Comply with industry standards except when more restrictive tolerances or specified requirements indicate more rigid standards or more precise workmanship.

B. Perform work by persons qualified to produce workmanship of specified quality.

C. Secure Products in place with positive anchorage devices designed and sized to withstand stresses, vibration, and racking.

1.05 MANUFACTURERS' INSTRUCTIONS

A. When work is specified to comply with manufacturers' instructions, submit copies of said instructions, as specified in Section 01 33 00, SUBMITTAL PROCEDURES, distribute copies to persons involved, and maintain one set in field office.

B. Perform work in accordance with details of instructions and specified requirements. Should a conflict exist between Specifications and manufacturer's instructions, consult with Architect.

**1.06 TRANSPORTATION AND HANDLING**

A. Arrange deliveries of products in accord with construction schedules, coordinate to avoid conflict with work and conditions at the site.

B. Transport Products by methods to avoid Product damage; deliver in undamaged condition in

manufacturer's unopened containers or packaging, dry.

C. Provide equipment and personnel to handle Products by methods to prevent soiling or damage.

D. Promptly inspect shipments to assure that Products comply with requirements, quantities are correct, and products are undamaged.

## 1.07 STORAGE AND PROTECTION

A. Store Products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive Products in weathertight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions.

B. For exterior storage of fabricated Products, place on sloped supports above ground. Cover Products subject to deterioration with impervious sheet covering; provide ventilation to avoid condensation.

C. Store loose granular materials on solid surfaces in a well-drained area; prevent mixing with foreign matter.

D. Arrange storage to provide access for inspection. Periodically inspect to assure Products are undamaged and are maintained under required conditions.

E. After installation, provide coverings to protect Products from damage from traffic and construction operations, remove when no longer needed.

## 1.08 PRODUCT OPTIONS

A. Within 7 days after date of Contract, submit complete list of major Products proposed, with name of manufacturer, trade name, and model.

B. Options:

1. Products specified only by reference standard: Any Product meeting that standard.
2. Products specified by naming several manufacturers: Products of any named manufacturer meeting Specifications.
3. Products specified by naming one or more manufacturers and "or equal": Submit a request for substitution for any manufacturer not specifically named.
4. Products specified by naming only one manufacturer: No option.

## 1.09 MATERIAL SUBSTITUTIONS

A. Where products or materials are specified by manufacturer's name, trade name or catalog reference, the words "or approved equal" shall be understood to follow unless there is a statement specifically indicating that no substitution will be allowed. An item shall be considered equal to the item so named or described if in the opinion of the Architect:

1. It is at least equal in quality, durability, appearance, strength, and design; including compliance with applicable specifications and compatibility with physical space allocations provided for the item.
2. It performs at least equally the function imposed by the general design for the work.

3. It conforms substantially, even with deviations to the detailed requirements for the item as indicated by the Contract Documents.

B. Where two or more products or materials are specified, the choice of these shall be optional with the Contractor.

C. Should the Contractor, after the award of the Contract, wish to use any products or materials other than those specified, he shall request written permission of the Architect, using SUBSTITUTION REQUEST FORM, Refer to Section 016010, SUBSTITUTION REQUEST FORM, immediately following this Section; Contractor shall submit this executed form with each proposed substitution. His request shall name and adequately describe (including shop drawings) the proposed substitutions, furnish any information requested by the Architect, and state what difference, if any, will be made in the Contract price, including the cost of changes in the Work, for such substitutions should they be accepted. Upon receipt of complete information from the Contractor, the Architect will consider all aspects of the proposed substitution and advise the Contractor in writing approving or disapproving the substitution. The principal reasons for approval or disapproval of the substitution will be enumerated by the Architect. Disapproval of the substitution shall not be cause for an increase in Contract price or a delay in schedule.

D. Request constitutes a representation that Contractor:

1. Has investigated proposed Product and determined that it meets or exceeds, in all respects, specified Product.
2. Will provide the same warranty for substitution as for specified Product.
3. Will coordinate installation and make other changes which may be required for Work to be complete in all respects.
4. Waives claims for additional costs which may subsequently become apparent.

E. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals without separate written request, or when acceptance will require substantial revision of Contract Documents.

F. Architect will determine acceptability of proposed substitution and will notify Contractor of acceptance or rejection in writing within a reasonable time.

## PART 2 PRODUCTS

### 2.01 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Descriptive, performance, and reference standard requirements in the Specifications

establish salient characteristics of products.

6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
   a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Evaluation of "or equal" product status is by the Owner and Architect, whose determinations are final.

B. Product Selection Procedures:

1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
   a. Sole product may be indicated by the phrase: "Subject to compliance with requirements, provide the following: …"
2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
   a. Sole manufacturer/source may be indicated by the phrase: "Subject to compliance with requirements, provide products by the following: …"
3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered unless otherwise indicated.
   a. Limited list of products may be indicated by the phrase: "Subject to compliance with requirements, provide one of the following: …"
4. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.

## 2.02 COMPARABLE PRODUCTS

A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:

1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant product qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
2. Evidence that proposed product provides specified warranty.
3. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.

4. Samples, if requested.

B. Submittal Requirements: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

**PART 3 - EXECUTION**
**(Not Used)**

**END OF SECTION**

# SECTION 01 70 00

# EXECUTION REQUIREMENTS

## PART 1 GENERAL

### 1.00 GENERAL PROVISIONS

A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

### 1.01 SUMMARY

A. This Section specifies field engineering services required for the Project, including but not limited to:

1. Construction layout.
2. Field engineering and surveying.
3. General installation of products.
4. Coordination of Owner-installed products.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

B. Owner's Representative will identify existing control points and property line corner stakes indicated on the Drawings, as required.

### 1.02 RELATED REQUIREMENTS

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 01010, SUMMARY; Project description.
2. Section 01780, CLOSEOUT PROCEDURES; Record documents.

### 1.03 SUBMITTALS

A. Only if requested by Architect or Owner:

1. Qualification Data: For land surveyor and/or professional engineer to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
2. Certificates: Submit certificate signed by land surveyor and/or professional engineer certifying that location and elevation of improvements comply with requirements.
3. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
4. Certified Surveys: Submit two copies signed by land surveyor and/or professional engineer.

## 1.04 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally registered in the State of Florida and who is experienced in providing land-surveying services of the kind indicated.

## PART 2 PRODUCTS
**(Not Used)**

## PART 3 EXECUTION

## 3.01 EXAMINATION

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

1. Before construction, verify the location and points of connection of utility services.

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

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

C. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

D. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
   a. Description of the Work.
   b. List of detrimental conditions, including substrates.
   c. List of unacceptable installation tolerances.

d. Recommended corrections.
2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

**3.02 PREPARATION**

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

C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect and Owner not less than two days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Owner's written permission.

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

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

F. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents. Submit requests on CSI Form 13.2A, "Request for Interpretation", a copy of which is attached at the end of this Section

**3.03 CONSTRUCTION LAYOUT**

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

B. General: Engage a land surveyor or professional engineer to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish limits on use of Project site.
3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
4. Inform installers of lines and levels to which they must comply.

5. Check the location, level and plumb, of every major element as the Work progresses.
6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

**3.03 FIELD ENGINEERING**

A. Identification: Owner will identify existing benchmarks, control points, and property corners.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.

E. Final Property Survey: Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor or professional engineer, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.

1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."

**3.04 INSTALLATION**

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.

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

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

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

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

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

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

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated,

arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

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

**3.05 PROGRESS CLEANING**

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

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

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

H. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

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

J. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure

operability without damaging effects.

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

**3.06 STARTING AND ADJUSTING**

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

**3.07 PROTECTION OF INSTALLED CONSTRUCTION**

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

B. Comply with manufacturer's written instructions for temperature and relative humidity.

**3.08 CORRECTION OF THE WORK**

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Section 017329, CUTTING AND PATCHING.

1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

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

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

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

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

**END OF SECTION**

# SECTION 01710 – CLEANING

## PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

A. Execute cleaning, during progress of the Work, and at completion of the Work, as required by the General Conditions.

1.2 RELATED REQUIREMENTS

A. All applicable sections of the Specifications.

B. Conditions of the Contract.

1.3 DISPOSAL REQUIREMENTS

A. Conduct cleaning and disposal operations to comply with codes, ordinances, regulations, and anti-pollution laws.

## PART 2 PRODUCTS

2.1 MATERIALS

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

B. Use only those cleaning materials and methods recommended by cleaning material manufacturer.

## PART 3 EXECUTION

3.1 DURING CONSTRUCTION

A. Execute periodic cleaning to keep the work, the site and adjacent properties free from accumulation of waste material, rubbish and windblown debris, resulting from Construction Work.

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

C. Remove waste materials, debris and rubbish from the site periodically and dispose of at legal disposal areas away from the site.

C. The OWNER's Representative reserves the right to direct the CONTRACTOR to remove waste materials

D. Mechanical Sweeping. CONTRACTOR shall maintain on site a mechanical sweeping device for removing debris from existing, temporary and permanent pavement.

3.2 DUST CONTROL

A. Perform operations so that dust and other contaminants resulting from Construction Work operations will not cause any damages or maintenance problems to adjacent properties.

B. Schedule operations so that dust and other contaminants resulting from cleaning process will not fall on wet or newly coated surfaces.

3.3 FINAL CLEANING

A. Employ skilled workmen for final cleaning.

B. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels, and other foreign materials from sight-exposed interior and exterior surfaces.

C. Polish glossy surfaces to a clear shine.

D. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.

E. Prior to final completion, or OWNER occupancy, CONTRACTOR shall conduct an inspection of sight-exposed interior and exterior surfaces, and all work areas, to verify the entire work is clean.

F. All storage and staging areas shall be cleaned and returned to prior conditions or better as per requirements of this section.

3.4 MEASUREMENT AND PAYMENT

A. There shall be no special measurement or payment for the work under this section; it shall be included in the price of all other work.

**END OF SECTION**

# SECTION 01780 CONTRACT CLOSEOUT

## PART 1 GENERAL

1.1 SUBMITTALS

A. Informational Submittals:

a. Submit prior to application for final payment.

i. Record Documents.

ii. As-built drawings (signed and sealed hardcopies and electronic format – PDF and CAD files)

iii. Special Bonds, Special Guarantees, and Service Agreements.

iv. Consent of Surety to Final Payment.

v. Releases or Waivers of Liens and Claims.

vi. Releases from Agreements.

vii. Final Application for Payment: Submit in accordance with procedures and requirements stated in Section 01025, Measurement and Payment.

viii. Spare Parts, Special Tools and Extra Materials: As required by individual Specification sections.

B. Subcontractor Identification Form:

a. Submit form with final pay request.

b. Submit a separate form for each subcontractor used.

c. For Capital Improvement Projects, submit form along with final pay request to the PCM.

d. Form is attached as a Supplement to this Section.

1.2 RECORD DOCUMENTS

A. Quality Assurance:

a. Furnish qualified and experienced person, whose duty and responsibility shall be to maintain record documents.

b. Accuracy of Records:

i. Coordinate changes within record documents, making legible and accurate entries on each sheet of Drawings and other documents where such entry is required to show change.

ii. Purpose of Project record documents is to document factual information regarding aspects of the Work, both concealed and visible, to enable future modification of the Work to proceed without lengthy and expensive site measurement, investigation, and examination.

c. Make entries within 24 hours after receipt of information that a change in the Work has occurred.

d. Prior to submitting each request for progress payment, request PCM's review and approval of current status of record documents. Failure to properly maintain, update, and submit record documents may result in a deferral by PCM to recommend whole or any part of Contractor's Application for Payment, either partial or final.

1.3 RELEASES FROM AGREEMENTS

A. Furnish Owner written releases from property owners or public agencies where side agreements or special easements have been made, or where Contractor's operations have not been kept within the Owner's construction right-of-way.

B. In the Event Contractor is Unable to Secure Written Releases:

a. Inform PCM of the reasons.

b. Owner or its representatives will examine the site, and Owner will direct Contractor to complete the Work that may be necessary to satisfy terms of the side agreement or special easement.

c. Should Contractor refuse to perform this Work, Owner reserves right to have it done by separate contract and deduct cost of same from Contract Price, or require Contractor to furnish a satisfactory Bond in a sum to cover legal claims for damages.

d. When Owner is satisfied that the Work has been completed in agreement with Contract Documents and terms of side agreement or special easement, right is reserved to waive requirement for written release if:

i. Contractor's failure to obtain such statement is due to grantor's refusal to sign, and this refusal is not based upon any legitimate claims that Contractor has failed to fulfill terms of side agreement or special easement, or

ii. Contractor is unable to contact or has had undue hardship in contacting grantor.

1.4 AS-BUILT DRAWINGS

A. Quality Assurance

a. As-built drawings must meet all minimum City of Fort Lauderdale CAD standards and be submitted in the latest version of AutoCAD available at the time the contract is signed.

b. As-built drawings will be submitted in both electronic and hard copy forms as follow:

i. 3 hard copy sets of as-builts will be submitted on 24x36 paper signed, sealed, and dated by a Florida Professional Licensed Surveyor (PLS).

ii. 1 CD or jump drive which will include both DWG files for the package and a PDF document including the surveyors signature and seal.

c. As-built drawings will include the following:

i. PLS name, business name, license numbers, address, and telephone number

ii. The following statement must be included:

"I hereby certify that the as-built location information of the potable water, reclaimed water, wastewater and drainage facilities shown on these drawings conforms to the minimum technical standards for land surveying in the State of Florida, Chapter 5J-17.050(10)(i) (Florida Administrative Code), as adopted by the Department of Agriculture and Consumer Services, Board of Professional Surveyors and Mappers, and that said as-builts are true and correct to the best of our knowledge and belief."

iii. As-built drawings will contain the information on the design drawings (plan and profile views) plus document changes between the design and construction including correcting all information that is incorrect due to changes during construction. Incorrect or no longer relevant information will be erased or struck through. All location changes constructed materially different (one-tenth foot horizontal, one tenth vertical) than the design location will have their design location struck through and will be redrafted at the constructed location. Design drawing dimensioning will be corrected as necessary.

iv. Drawing will be a complete set including cover sheet, index, and any other sheets included in the approved design set. Standard detail sheets are not necessary.

B. Minimum As-Built Drawing Requirements (Not applicable for this project)

a. Show the location of easements used by the water and wastewater facilities.

b. Indicate pipe joint locations where water and wastewater or reclaimed water piping crosses.

c. Indicated the length of gravity wastewater piping and actual slope between manhole centers.

d. Show all abandoned in place facilities including the extent and method of abandonment.

e. Show elevations to the nearest tenth of a foot for top of pipe for water mains, force mains, and reclaimed water mains at vertical deflection points, all bends, valves and fittings and every 200 feet along straight runs and where they cross all other facilities.

f. Show elevations to the nearest one hundredth of a foot for manhole rims, gravity main inverts at the manhole, force main connections to manholes, lift station top of slab, bottom of wet well, influent pipe invert and control set points.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION**

3.1 MAINTENANCE OF RECORD DOCUMENTS

A. General:

a. Promptly following commencement of Contract Times, secure from Engineer, at no cost to Contractor, one complete set of Contract Documents. Drawings will be full size.

b. Delete Engineer title block and seal from all documents.

c. Label or stamp each record document with title, “RECORD DOCUMENTS,” in neat large printed letters.

d. Record information concurrently with construction progress and within 24 hours after receipt of information that change has occurred. Do not cover or conceal Work until required information is recorded. Contractor is responsible for maintaining up-to-date “red-lined” markups, on site, of all changes including revised locations of buried features and provides access to the City for review at any time.

e. All piping inserts, fittings, and valve locations shall be located by a Florida Licensed Surveyor in accordance with City of Fort Lauderdale surveying standards and per NAVD 88. Contractor shall provide adequate notice

to the surveyor to ensure that all locations are accessible, prior to backfill.

B. Preservation:

a. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.

b. Make documents and Samples available at all times for observation by PCM or Engineer.

C. Making Entries on Drawings:

a. Using an erasable colored pencil (not ink or indelible pencil), clearly describe change by graphic line and note as required.

i. Color Coding:

a. Green when showing information deleted from Drawings.

b. Red when showing information added to Drawings.

c. Blue and circled in blue to show notes.

b. Date entries.

c. Call attention to entry by “cloud” drawn around area or areas affected.

d. Legibly mark to record actual changes made during construction, including, but not limited to:

i. Depths of various elements of foundation in relation to finished first floor data if not shown or where depth differs from that shown.

ii. Horizontal and vertical locations of existing and new Underground Facilities and appurtenances, and other underground structures, equipment, or Work. Reference to at least two measurements to permanent surface improvements.

iii. Location of internal utilities and appurtenances concealed in the construction referenced to visible and accessible features of the structure.

iv. Locate existing facilities, piping, equipment, and items critical to the interface between existing physical conditions or construction and new construction.

v. Changes made by Addenda and Field Orders, Work Change Directive, Change Order, Written Amendment, and Engineer's written interpretation and clarification using consistent symbols for each and showing appropriate document tracking number.

e. Dimensions on Schematic Layouts: Show on record drawings, by dimension, the centerline of each run of items such as are described in previous subparagraph above.

i. Clearly identify the item by accurate notes such as “cast iron drain,” “galv. water,” and the like.

ii. Show, by symbol or note, vertical location of item (“under slab,” “in ceiling plenum,” “exposed,” and the like).

iii. Make identification so descriptive that it may be related reliably to Specifications.

D. Coordination with Florida Licensed surveyor:

a. Contractor shall not cover any bends, valves, or fittings installed until they have been located by the survey crews for the purpose of preparing as-built and/or Record Drawings.

b. If the above conditions are not met, for any reason, Contractor shall bear the cost of potholing the constructed installation to allow for the locations.

3.2 FINAL CLEANING

A. At completion of the Work or of a part thereof and immediately prior to Contractor's request for certificate of Substantial Completion; or if no certificate is issued, immediately prior to Contractor's notice of completion, clean entire site or parts thereof, as applicable.

a. Leave the Work and adjacent areas affected in a cleaned condition satisfactory to Owner and PCM.

b. Remove grease, dirt, dust, paint or plaster splatter, stains, labels, fingerprints, and other foreign materials from exposed surfaces.

c. Repair, patch, and touch up marred surfaces to specified finish and match adjacent surfaces.

d. Clean all windows.

e. Clean and wax wood, vinyl, or painted floors.

f. Broom clean exterior paved driveways and parking areas.

g. Hose clean sidewalks, loading areas, and others contiguous with principal structures.

h. Rake clean all other surfaces.

i. Replace air-handling filters and clean ducts, blowers, and coils of ventilation units operated during construction.

j. Leave water courses, gutters, and ditches open and clean.

B. Use only cleaning materials recommended by manufacturer of surfaces to be cleaned.

C. Meet all requirements of Section 02575, Surface Restoration.

3.3 SUPPLEMENTS

*A.* The supplements listed below, following “END OF SECTION,” are part of this Specification.

*a. Subcontractor Identification Form (See next page).*

**END OF SECTION**

# SECTION 01 78 23

# OPERATION AND MAINTENANCE DATA

## PART 1 GENERAL

### 1.00 GENERAL PROVISIONS

A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

### 1.01 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Maintenance manuals for the care and maintenance of products, materials, and finishes, systems and equipment.

### 1.02 RELATED REQUIREMENTS

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Division 01 Section "Closeout Procedures" for submitting operation and maintenance manuals.
3. Division 01 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
4. Section 01 79 00, Demonstration and Training.
5. Divisions 02 through 50 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

### 1.03 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

### 1.04 SUBMITTALS

A. Initial Submittal: Submit 2 draft copies of each manual at least 15 days before requesting inspection for Substantial Completion. Include a complete operation and maintenance

directory. Architect will return one copy of draft and mark whether general scope and content of manual are acceptable.

B. Format: Submit operation and maintenance manuals in the following format:

1. Submit on digital media acceptable to Architect, by uploading to web-based project software site, or by email to Architect. Enable reviewer comments on draft submittals.

C. Final Submittal: Submit one copy of each manual in final form at least **15** days before final inspection. Architect will return copy with comments within 15 days after final inspection.

1. Correct or modify each manual to comply with Architect's comments. Submit 3 copies of each corrected manual within 15 days of receipt of Architect's comments.

## 1.05 COORDINATION

A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

# PART 2 - PRODUCTS

## 2.01 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Organization: Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

## 2.02 MANUALS, GENERAL

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.

2. Table of contents.
3. Manual contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name, address, and telephone number of Contractor.
6. Name and address of Architect.
7. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Bookmark individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

E. Manuals, Paper Copy: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
   a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary, to provide essential information for proper operation or maintenance of equipment or system.
   b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.

3. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
5. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
   a. Avoid placing loose, oversize drawings in binder pockets. Use reduced drawings or place folded drawings in labeled envelopes bound in manual.
   b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

## 2.03 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

## 2.04 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.

5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed and identify color-coding where required for identification.

**2.05 PRODUCT MAINTENANCE MANUAL**

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross- reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.

3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

## 2.06 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard printed maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training videotape, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine

maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds. Include procedures to follow and required notifications for warranty claims.

## PART 3 - EXECUTION

### 3.01 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence

and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

1. Do not use original Project Record Documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared Record Drawings in Division 01 Section "Closeout Procedures."

G. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

**END OF SECTION**

# SECTION 01 78 39

# PROJECT RECORD DOCUMENTS

## PART 1 GENERAL

### 1.00 GENERAL PROVISIONS

A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

### 1.01 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.

B. Related Sections include the following:

1. Division 01 Section "Closeout Procedures" for general closeout procedures.
2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Divisions 02 through 50 Sections for specific requirements for Project Record Documents of the Work in those Sections.

### 1.02 SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one (1) set of marked-up Record Prints in electronic format.

B. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit annotated PDF electronic files and directories of each submittal.

## PART 2 - PRODUCTS

### 2.01 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.

a. Accurately record information in an understandable drawing technique.
b. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:
   a. Dimensional changes to Drawings.
   b. Revisions to details shown on Drawings.
   c. Depths of foundations below first floor.
   d. Locations and depths of underground utilities.
   e. Revisions to routing of piping and conduits.
   f. Revisions to electrical circuitry.
   g. Actual equipment locations.
   h. Duct size and routing.
   i. Locations of concealed internal utilities.
   j. Changes made following Architect's written orders.
   k. Details not on the original Contract Drawings.
   l. Field records for variable and concealed conditions.
   m. Record information on the Work that is shown only schematically.
3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect**.** When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:

1. Format: Same digital data software program, version, and operating system as the original Contract Drawings.
2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
3. Refer instances of uncertainty to Architect for resolution.
4. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.
   a. Architect will provide data file layer information. Record markups in separate layers.

C Newly Prepared Record Drawings: Prepare new Drawings instead of preparing Record Drawings where Architect determines that neither the original Contract Drawings nor Shop Drawings are suitable to show actual installation.

1. New Drawings may be required when a Change Order is issued as a result of accepting an alternate, substitution, or other modification.
2. Consult Architect for proper scale and scope of detailing and notations required to record the actual physical installation and its relation to other construction. Integrate newly prepared Record Drawings into Record Drawing sets; comply with procedures for formatting, organizing, copying, binding, and submitting.

C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD

DRAWING" in a prominent location.

1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
2. Format: Annotated PDF electronic file with comment function enabled.
3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
4. Identification: As follows:
   a. Project name.
   b. Date.
   c. Designation "PROJECT RECORD DRAWINGS."
   d. Name of Architect and Owner.
   e. Name of Contractor.

## 2.02 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
4. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
5. Note related Change Orders, Record Product Data, and Record Drawings where applicable.

B. Format: Submit record Specifications as scanned PDF electronic file(s) of marked-up paper copy of Specifications.

## 2.03 RECORD PRODUCT DATA

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Specifications, and Record Drawings where applicable.

C. Format: Submit record Product Data as scanned PDF electronic file(s) of marked-up paper copy of Product Data.

1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

### 2.04 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as scanned PDF electronic file(s) of marked-up miscellaneous record submittals.

1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

## PART 3 - EXECUTION

### 3.01 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

## END OF SECTION

# SECTION 01 79 00

# DEMONSTRATION AND TRAINING

## PART 1 - GENERAL

### 1.1 GENERAL PROVISIONS

A. Attention is directed to the PROCUREMENT AND CONTRACTING REQUIREMENTS and all Sections within DIVISION 01, GENERAL REQUIREMENTS, which are made a part of this Section of the Specifications.

### 1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Instruction in operation and maintenance of systems, subsystems, and equipment.
2. Demonstration and training video recordings.

### 1.3 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

B. Attendance Record: For each training module, submit list of participants and length of instruction time.

C. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

### 1.4 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit **two** copies within **seven** days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:

    a. Name of Project.
    b. Name and address of videographer.
    c. Name of Architect.
    d. Name of Contractor.
    e. Name of SubContractor.
    f. Date of video recording.
2. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
3. At completion of training, submit complete training manual(s) for Owner's use prepared in same PDF file format required for operation and maintenance manuals specified in Section 01 78 23 "Operation and Maintenance Data."

## 1.5 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative experienced in operation and maintenance procedures and training.

C. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

## 1.6 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

## 1.7 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:

    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.
    g. Limiting conditions.
    h. Performance curves.

2. Documentation: Review the following items in detail:

    a. Emergency manuals.
    b. Systems and equipment operation manuals.
    c. Systems and equipment maintenance manuals.
    d. Product maintenance manuals.
    e. Project Record Documents.
    f. Identification systems.
    g. Warranties and bonds.
    h. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

    a. Instructions on meaning of warnings, trouble indications, and error messages.
    b. Instructions on stopping.
    c. Shutdown instructions for each type of emergency.
    d. Operating instructions for conditions outside of normal operating limits.
    e. Sequences for electric or electronic systems.
    f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

    a. Startup procedures.
    b. Equipment or system break-in procedures.
    c. Routine and normal operating instructions.
    d. Regulation and control procedures.
    e. Control sequences.
    f. Safety procedures.
    g. Instructions on stopping.
    h. Normal shutdown instructions.
    i. Operating procedures for emergencies.
    j. Operating procedures for system, subsystem, or equipment failure.
    k. Seasonal and weekend operating instructions.

l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning.
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.
b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

## 1.8 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

B. Set up instructional equipment at instruction location.

## 1.9 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.

B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner; with at least 14 (fourteen) days' advance notice.

D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

E. Cleanup: Collect used and leftover educational materials and give to Owner. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

## 1.10 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. Digital Video Recordings: Provide high-resolution, digital video.

1. Submit video recordings on thumb drive or by uploading to web-based Project software site.
2. File Hierarchy: Organize folder structure and file locations according to Project Manual table of contents. Provide complete screen-based menu.
3. File Names: Utilize file names based on name of equipment generally described in video segment, as identified in Project specifications.
4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the equipment demonstration and training recording that describes the following for each Contractor involved on the Project, arranged according to Project Manual table of contents:

    a. Name of Contractor/Installer.
    b. Business address.
    c. Business phone number.
    d. Point of contact.
    e. Email address.

B. Mechanical, Electrical and Plumbing Systems, subsystems and equipment that require demonstration and training are described in individual related specification sections.

## PART 2 - PRODUCTS

## PART 3 - EXECUTION

**END OF SECTION**

SECTION 03 11 00
CONCRETE FORMWORK

PART 1 GENERAL

1.1 SECTION INCLUDES

1.2 FORMWORK FOR CONCRETE

A. Related accessories

1.3 REFERENCES

A. ACI 301 - Specifications for Structural Concrete Buildings
B. ACI 318 - Building Code Requirements for Structural Concrete
C. ACI 347 - Guide to Formwork for Concrete
D. ACI SP-4: Formwork for Concrete
E. ASTM E1643 - -Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs
F. ASTM E1745 - Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs
G. ASTM D1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)

1.4 SYSTEM DESCRIPTION

A. Concrete Formwork: For surfaces of cast-in-place concrete to be unexposed or to receive rubbed finish.
B. Form footings and slabs on grade, earth forming are not allowed.

C. Design/Performance Requirements: Design, engineering and construction of formwork and shoring is the responsibility of the Contractor.
   1. Design formwork with sufficient strength to withstand forces due to placement and vibration and sufficient rigidity to maintain specified tolerances.
   2. Design loads, lateral pressure, and allowable stresses in accordance with ACI 347.

1.5 SUBMITTALS

A. Product Data: Proprietary materials and items, including forming accessories, water stops, joint systems, and others

Shop Drawings:

1. Show form construction including jointing, special form joints and reveals, location and pattern of form tie placement, and other items that affect exposed concrete visually.
2. Prepare, sign, and seal by a professional engineer registered in the State of Florida.

B. Structural Calculations (Threshold Buildings):
   1. Prepare and submit complete design calculations, plans, and details for shoring and re-shoring procedures, indicating conformance to specified performance and design criteria; signed, and sealed by a professional engineer registered in the State of Florida.
   2. Submit calculations for review information only, will not check for accuracy

PART 2 PRODUCTS

*DELETE MATERIALS THAT DO NOT OCCUR IN THIS PROJECT.*

2.1 FORM MATERIALS

A. Concrete Forms for Beams, Columns, and Slabs:
   1. New or properly reconditioned material designed to conform to requirements of ACI SP-4 and to support wet concrete without deflection.
   2. Plywood Panels: PS-1 B-B plywood, Class 1, EXT-APA, sanded, mill oiled, and edge sealed.

2.2 RELATED MATERIALS

A. Vapor Retarder: Related section 07 26 00.
B. Form Coatings: Colorless commercial formulation form release and sealer compounds that will not bond with, stain, nor adversely affect concrete surfaces, and will not impair subsequent treatments of concrete surfaces.
C. Form Ties: Adjustable length, removable or snap off metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal, 1½" break back, and maximum hole left 1¼" diameter.
D. Bevels and Rustications: Wood strips milled to shapes indicated or formed rigid plastic strips.
E. Dovetail Anchor Slots: 24-ga. galvanized steel with release tape sealed slots and bent tab anchors.
F. Flashing Reglets shall be 16-oz. copper with release tape sealed slots and alignment splines at end joints.
G. Construction Joints shall be 24-ga. galvanized steel keyway form type with knockout holes spaced 6" o. c. to receive doweling.
H. Form Joint System for Architectural Concrete Forms:
   1. Gaskets shall be closed cell foam tape - Source Product/Mfg. - No. 4016 by 3M.
   2. Caulk: Rubberized, non-staining silicone compound GE Product/Mfg. - No. 1201.
   3. Tape: 2-mil Mylar - source Product/Mfg. - No. 371 by 3M.
I. Mastic Water stop: Preformed plastic or butyl resin strips. Source Products/Mfg:
   1. Synko-Flex/Synko-Flex Products Co.
   2. ConSeal CS-102/Concrete Sealants
J. Joint Fillers: Pre-molded mastic strips, asphalt impregnated, ASTM D1751.
K. Fasteners and Anchorages: Nails, spikes, bolts, lag bolts, and other types sized as required to maintain formwork in place.

## PART 3 EXECUTION

### 3.1 EXAMINATION

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

### 3.2 INSTALLATION TOLERANCES

A. Allowable tolerances for Structural Concrete Forms shall comply with ACI 301 and 347.
B. Allowable tolerances for camber in slabs and beams shall comply with ACI 301.
C. Allowable tolerances for plumbness in elevator shafts shall comply with requirements of ASME A17.1.

### 3.3 ERECTION

A. Design, erect, support, brace, and maintain formwork to support vertical and lateral, static, and dynamic loads that may occur before permanent bracing can support such loads.
B. Construction:
    1. Construct formwork so finished concrete members and structures are of correct size, shape, alignment, elevation, and position.
    2. Build formwork to be readily removable without impact, shock, or damage to cast-in-place concrete surfaces and adjacent materials.
    3. Provide openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required.
    4. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.
    5. Provide temporary openings at bottoms of forms to facilitate cleanout and inspection.
        a. Close openings with tight fitting panels and neat joints so that joints will not be apparent in exposed concrete surfaces.
C. Chamfer exposed corners and edges as indicated, or if not indicated, provide ¾" x ¾".
D. Provide openings in concrete formwork to accommodate work of other trades.
    1. Determine size and location of openings, recesses, and chases from trades providing such items.
    2. Accurately place and securely support items built into forms.
E. Thoroughly clean forms and adjacent surfaces to receive concrete.
    1. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete.
    2. Retighten forms and bracing after concrete placement to eliminate mortar leaks and maintain proper alignment.
F. Construction Joints:
    1. Locate and install formed construction joints at rustications or, if not indicated, locate so as not to impair strength and appearance of the structure, and as approved by the A/E.

2. Provide keyways at least 1½" deep in construction joints in walls, slabs, and between walls and footings; accepted bulkheads designed for this purpose may be used for slabs.
3. Place construction joints perpendicular to main reinforcement.
    a. Continue reinforcement across construction joints, except as otherwise indicated.

G. Isolation Joints in Slabs-on-Ground: Construct continuous joint filler at points of contact between slabs-on-ground and vertical surfaces, such as column pedestals, foundations walls, grade beams, and elsewhere as indicated.

H. Form Coatings: Apply after erecting forms and sealing the joints but prior to placing reinforcing steel, anchoring devices, and embedded items.
1. Seal surfaces of wood rustications with two coats of form sealer.
2. Spray-apply one coat of release agent to formwork faces except concrete surfaces scheduled to receive special finishes or special coatings.
3. Coat steel forms with a non-staining, rust- preventative form oil to protect against rusting.
    a. Rust-stained steel formwork is not acceptable.

I. Embedded Items: Set and build into work anchorage devices and other embedded items required for other work attached to, or supported by, cast-in-place concrete.

J. Reglets: Install to receive top edge of foundation sheet waterproofing, and to receive thru-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, relieving angles, and other conditions.

K. Vapor Retarder: Place, protect, and repair vapor-retarder sheets according to ASTM E1643 and manufacturer's written instructions.

## 3.4 RE-USE OF FORMS

A. Clean re-used forms of concrete matrix residue, repair, and patch as required returning forms to acceptable surface condition.

B. Recoat contact surfaces of forms with a form-coating compound as specified.

## 3.5 SHORES AND SUPPORTS

A. Comply with ACI 347 for shoring and re-shoring in multistory construction, for beams, girders, raised slabs, and as herein specified.

B. Space all shoring in such a manner as to prevent any floor or member from excessive loading or inducing stress in any of the concrete members.
1. Extend shores beyond minimums to ensure proper distribution of loads throughout structure.

## 3.6 REMOVAL OF FORMS AND SHORING

A. Remove formwork and shoring progressively and in accordance with ACI 301 and ACI 347 to prevent unbalanced loads on the structure.

B. Do not remove shoring and formwork until members have acquired strength as specified by the engineer of record.
1. Re-shore structural members as original shores are removed as specified by the engineer of record.

C. In the event the Contractor wishes to remove formwork at an earlier time than specified, the Contractor shall pay for and have testing laboratory obtain two additional concrete test cylinders to confirm strength requirement for early form removal.

END OF SECTION

SECTION 03 20 00
CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Reinforcing steel bars, wire fabric and accessories for cast-in-place concrete

1.2 REFERENCES

A. ACI 301 - Structural Concrete for Buildings
B. ACI 318 - Building Code Requirements For Reinforced Concrete
C. ACI SP-66 - American Concrete Institute - Detailing Manual
D. ASCE 7 - Minimum Design Loads of Buildings and Other Structures
E. ASTM A185/A185M - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete
F. ASTM A496/A496M - Standard Specification for Steel Wire Deformed for Concrete Reinforcement
G. ASTM A497/A497M - Standard Specification for Steel Welded Wire Reinforcement Deformed for Concrete
H. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
I. ASTM A767/A767M- Standard Specification for Zinc Coated (Galvanized) Steel Bars for Concrete Reinforcement
J. ASTM A775/A775M- Standard Specification for Epoxy Coated Reinforcing Steel Bars
K. ASTM D3963/D3963M - Standard Specification for Fabrication and Jobsite Handling of Epoxy Coated Reinforcing Bars
L. AWS D1.4 - Structural Welding Code-Reinforcing Steel
M. CRSI - Concrete Reinforcing Steel Institute - Manual of Standard Practice
N. CRSI - Placing Reinforcing Bars
O. FBC - Florida Building Code

1.3 SUBMITTALS FOR REVIEW

A. Section 01 33 00 - Submittals Procedures
B. Shop Drawings: Indicate bar sizes, spacing, locations, wall elevations, quantities of reinforcing steel and wire fabric, bending and cutting schedules, and supporting and spacing devices.

1.4 SUBMITTALS FOR INFORMATION

A. Section 01 33 00 - Submittals Procedures
B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
C. Submit certified copies of mill test report of reinforcement materials analysis.

1.5 DESIGN REQUIREMENTS

A. Design shall comply with the FBC, ASCE 7 – Wind Loads, and ACI 318.
B. Do not weld reinforcing steel.

1.6 QUALITY ASSURANCE

A. Perform work in accordance with ACI 301. Maintain one copy of document on site.
B. Design reinforcement under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State of Florida.
C. Submit under provisions of Section 01 40 00 Manufacturer's Certificates, certifying welders employed on the work, verifying AWS qualification within the previous 12 months.

PART 2 PRODUCTS

2.1 REINFORCEMENT

A. Reinforcing Steel: ASTM A615/A615M, Grade 60; deformed carbon steel bars, unfinished
B. Welded Steel Wire Fabric: ASTM A185/A185M Plain Type; in flat sheets and rolls; unfinished
C. Steel Wire: ASTM A82/A82M, plain, cold drawn, steel

2.2 ACCESSORIES

A. Tie Wire: Minimum 16 gage annealed type or patented system.
B. Chairs, Bolsters, Bar Supports, Spacers: Size and shape for strength and reinforcement support during concrete placement, include load bearing pad on bottom to prevent vapor barrier puncture.
C. Special Chairs, Bolsters, Bar Supports, and Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic coated steel type; size and shape as required.

2.3 FABRICATION

A. Fabricate concrete reinforcing in accordance with ACI 318.
B. Weld reinforcement in accordance with AWS D1.4.
C. Locate reinforcing splices not shown on plans, at point of minimum stress and review with A/E.

PART 3 EXECUTION

3.1 PLACEMENT

A. Place support and secure reinforcement against displacement, without deviating from the required position.
B. Do not displace or damage vapor barrier.
C. Accommodate placement of formed openings.

D. Conform to applicable code for concrete cover over reinforcement.

3.2 FIELD QUALITY CONTROL

A. Architect, Owner, or Building Department may request field inspections per Section 01 40 00 1.7 Inspection Services.

END OF SECTION

SECTION 03 30 00
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Cast-in-place concrete foundation walls, footings, and supported slabs.
B. Slabs on grade.
C. Control, expansion, and contraction joint devices associated with concrete work, including joint sealants.
D. Equipment pads.

1.2 REFERENCES

A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal weight Concrete
B. ACI 211.2 - Standard Practice for Selecting Proportions for Structural Lightweight Concrete
C. ACI 301 – Specifications Structural Concrete for Buildings
D. ACI 302.2R - Guide for Concrete Floor and Slab Construction
E. ACI 304R - Guide for Measuring, Mixing, Transporting and Placing Concrete
F. ACI 305R - Hot Weather Concreting.
G. ACI 306R - Cold Weather Concreting.
H. ACI 308.1 - Standard Specification for Curing Concrete
I. ACI 318 - Building Code Requirements for Structural Concrete
J. ACI 347 - Guide to Formwork for Concrete
K. ASTM C33/C33M - Standard Specification for Concrete Aggregates
L. ASTM C39/C39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
M. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete
N. ASTM C150/C150M - Standard Specification Portland Cement
O. ASTM C260/C260M - Standard Specification Air Entraining Admixtures for Concrete
P. ASTM C330/C330M - Standard Specification Light Weight Aggregates for Structural Concrete
Q. ASTM C494/C494 - Standard Specification for Chemical Admixtures for Concrete
R. ASTM C1017/C1017M - Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
S. ASTM D994/D994M - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
T. FBC - Florida Building Code
U. ASCE 7 – Minimum Design Loads for Buildings and other Structures.

1.3 RELATED SECTIONS

A. 31 20 00 Earth Moving
B. 31 31 16 Termite Control
C. 03 11 00 Concrete Formwork
D. 07 26 00 Vapor Retarders

1.4 SUBMITTALS FOR REVIEW and INFORMATION

A. Section 01 33 00 Submittals Procedures
B. Product Data: Provide data on joint devices, attachment accessories, admixtures, curing compound, sealers, and integral coloring.
C. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent Work.
D. Samples: Submit two 12" long samples of expansion/contraction joint and control joint.
E. Shop Drawings:
    1. Submit drawings indicating the locations of all joints in the concrete, construction joints, expansion joints, and contractions joints.
    2. Include concrete placement schedule, method, sequence, quantities, location, and boundaries.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

A. Section 01 77 00 Contract Closeout: Procedures for submittals
B. Accurately record actual locations of embedded utilities and components concealed from view.

1.6 DESIGN REQUIREMENTS

A. Design in conformance with Florida Building Code, ACI 318, and ACI 301.
B. Provide expansion joints, control joints, construction joints, and isolation joints to prevent uncontrolled stress cracks in the structure and according to the latest engineering standards.

1.7 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301.
B. Mix and deliver ready mixed concrete in accordance with ASTM C94/C94M.
C. Maintain one copy of each document on site.
D. Acquire cement and aggregate from same source for all work.
E. Conform to ACI 305R when concreting during hot weather.
F. Conform to ACI 306R when concreting during cold weather.

1.8 MOCK-UP

A. Comply with the requirements of section 01 40 00 Quality Control, Requirements for mock-up.
B. Construct and erect a field sample for architectural concrete surfaces receiving special treatment or finish as result of formwork.
C. Sample Panel: Sufficient size to indicate special treatment or finish required.
D. If requested by A/E, cast concrete against sample panel.
    1. Obtain acceptance of resultant surface finish prior to erecting formwork.
E. Use the approved sample panel for basis of quality for the finished work.
    1. Keep sample panel exposed to view for duration of concrete work.

F. Locate where directed.
G. Mock-up may not remain as part of the Work.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

A. Cement: ASTM C150/C150M, Type I - Normal, Portland type
B. Fine and Coarse Aggregates: ASTM C33/C33M
C. Lightweight Aggregate: ASTM C330/C330M
D. Water: Clean and not detrimental to concrete
E. Glass Fiber Reinforcement: ASTM C948

2.2 ADMIXTURES

A. Air Entrainment: ASTM C260/C260M
B. Chemical: ASTM C494/C494M
   1. Water Reducing - Type A
   2. Retarding - Type B
   3. Accelerating - Type C
   4. Water Reducing and Retarding - Type D
   5. Water Reducing and Accelerating - Type E
   6. Water Reducing, High Range - Type F
   7. Water Reducing, High Range and Retarding - Type G
   8. Flowing Concrete - ASTM C1017/C1017M

2.3 ACCESSORIES

A. Bonding Agent: Polymer resin emulsion, Polyvinyl Acetate, Latex emulsion, 2-component-modified epoxy resin, Non-solvent two-component polysulfide epoxy, Mineral filled polysulfide polymer epoxy, Mineral filled polysulfide polymer epoxy-resin, and Versamid cured epoxy.
B. Vapor Barrier: Flexible, sandwich of heavy paper, reinforced fibers, and two layers of inert polyethylene, formed into one layer under heat and pressure. (Perm rating of 0.1)
C. Non-Shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 psi in 48 hours and 7,000 psi in 28 days.

2.4 JOINT DEVICES AND FILLER MATERIALS

A. Joint Filler: ASTM D1751; Asphalt impregnated fiberboard or felt
B. Joint Filler: ASTM D1752; Closed cell polyvinyl chloride foam, resiliency recovery of 95% if not compressed more than 50% of original thickness
C. Sealant and Primer: Type, as specified in Section 07 92 00

D. Sealant: Cold applied

2.5 CONCRETE MIX

A. Mix concrete in accordance with ACI 304. Deliver concrete in accordance with ASTM C94/C94M
B. Select proportions for normal weight concrete in accordance with ACI 301 Method 3
C. Select aggregate proportions for lightweight concrete in accordance with ASTM C330/C330M
D. Use accelerating admixtures in cold weather only when approved by A/E
   1. Use of admixtures will not relax cold weather placement requirements.
E. Use set retarding admixtures during hot weather only when approved by A/E
F. Add air-entraining agent to normal weight concrete mix for work exposed to exterior

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Section 01 31 00.
B. Verify requirements for concrete cover over reinforcement.
C. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

3.2 PREPARATION

A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
B. In locations where doweling new concrete to existing work, drill holes in existing concrete; insert steel dowels and pack solid with non-shrink grout.
C. Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.
D. Remove all foreign matter and water from forms or structural excavations.

3.3 FORMWORK

A. Conform to ACI 347
B. Form foundations, earth forms not allowed, unless Engineer of record and the Soil's report can provide information to building official showing the soil conditions are conducive to earth forms.

3.4 PLACING CONCRETE

A. Place concrete in accordance with ACI 301.
B. Notify A/E minimum 24 hours prior to commencement of operations
C. Ensure reinforcement, inserts, embedded parts, formed expansion, and contraction joints are not disturbed during concrete placement.
D. Treat for termites per section 31 31 16.

E. Install vapor retarder under interior slabs on grade, lap joints minimum 6", and seal watertight by taping edges and ends.
F. Repair vapor retarder damaged during placement of concrete reinforcing.
    1. Repair with vapor retarder material; lay over damaged areas minimum 6" and seal watertight.
G. Separate slabs on grade from vertical surfaces with joint filler.
H. Place joint filler in floor slab pattern placement sequence.
    1. Set top to required elevations.
    2. Secure to resist movement by wet concrete.
I. Extend joint filler from bottom of slab to within ¼" of finished slab surface.
    1. Conform to Section 07 92 00 for finish joint sealer requirements.
J. Install joint covers in one-piece length, when adjacent construction activity is complete.
K. Apply sealants in joint devices in accordance with Section 07 92 00.
L. Maintain records of concrete placement.
    1. Record date, location, quantity, air temperature, and test samples taken.
M. Place concrete continuously between predetermined expansion, control, and construction joints.
N. Do not interrupt successive placement; do not permit cold joints to occur.
O. Place floor slabs in checkerboard or saw cut pattern indicated.
P. Saw cut joints within 24 hours after placing.
    1. Use $^{3}/_{16}$" thick blade, cut into ¼ depth of slab thickness.
Q. Screed floors and slabs on grade level, maintaining surface flatness of maximum ⅛" in 10'.

## 3.5 SEPARATE FLOOR TOPPINGS

A. Prior to placing floor topping, roughen substrate concrete surface, and remove deleterious material, broom and vacuum clean.
B. Place dividers, edge strips, reinforcing, and other items being cast in the pour as required.
C. Apply bonding agent to substrate in accordance with manufacturer's instructions.
D. Place concrete floor toppings to required lines and levels.
E. Place topping in checkerboard panels with dimensions not exceeding 20'.
F. Screen toppings level, maintaining surface flatness of maximum 1:1000.

## 3.6 CONCRETE FINISHING

A. Provide formed concrete surfaces with exposed, concrete walls, columns, beams, joists, with smooth rubbed finish.
B. Finish concrete floor surfaces in accordance with ACI 301.
C. Wood-float the surfaces that receive quarry tile, ceramic tile, and terrazzo with full bed setting system.
D. Steel trowel surfaces that receive carpeting, resilient flooring, seamless flooring, thin-set quarry tile, and thin set ceramic tile.
E. Steel trowel surfaces scheduled to be exposed.

F. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:50 nominal.

## 3.7 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
C. Cure floor surfaces in accordance with ACI 308.
D. Ponding: Maintain 100% coverage of water over floor slab areas continuously for 4 days.
E. Spraying: Spray water over floor slab areas and maintain wet for 7 days.

## 3.8 FIELD QUALITY CONTROL

A. Architect, Owner, or Building Department may request field inspections per Section 01 40 00 1.7 Inspection Services
B. Provide free access to Work and cooperate with appointed firm.
C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of Work.
D. The Owner may perform tests of cement and aggregates to ensure conformance with specified requirements.
E. Take three concrete test cylinders for every 150 cu yards or less of each class of concrete placed.
F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
G. Take one slump test for each set of test cylinders taken.

## 3.9 PATCHING

A. Contractor shall allow A/E to inspect concrete surfaces immediately upon removal of forms.
B. Excessive honeycomb or embedded debris in concrete is not acceptable; notify A/E upon discovery.
C. Patch imperfections in accordance with ACI 301.

## 3.10 DEFECTIVE CONCRETE

A. Defective concrete is concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
B. A/E shall determine the repair or replacement of defective concrete.
C. Do not patch, fill, touch-up, repair or replace-exposed concrete except upon express direction of A/E for each individual area.

END OF SECTION

# SECTION 03 45 00

# CUSTOM PRECAST CONCRETE

## Part 1 – GENERAL

### 1.01 SUMMARY

A. Perform all work required to furnish and complete the proper installation of precast concrete.

B. Types of Precast Concrete work include:
   1. Precast Concrete Benches – refer to drawings for precast dimensions.

C. Setting material, grouts, sealants, and caulks

D. Installation of precast concrete

E. Related work not specified under this section.
   1. Installation of steel units to receive precast concrete.
   2. Installation of Concrete substrate to receive precast.

### 1.02 REFERENCES

A. American Society for Testing and Materials (ASTM)
   1. ASTM C-150
   2. ASTM C-128
   3. ASTM C-260
   4. ASTM C-31
   5. ASTM C-494
   6. ASTM C-39

B. Precast Concrete Institute (PCI)

### 1.03 SUBMITTALS

A. Shop Drawings
   1. Submit fabrication drawings of all precast concrete items showing detailed sections and profile for all precast items. Details shall show all reinforcing and cast in hardware.

B. Samples
   1. Submit 1 sample for color and texture approval.
      a. Color to be selected from manufacturer's standard offerings.
      b. Match existing or architect’s sample.

C. Submit a copy of manufacturer's Quality Assurance and Procedure Manual

D. Performance Requirements
   1. Compressive Strength 5,000 pounds per square inch minimum
   2. Air Content 6-8%
   3. Water-Cement Ration .45
   4. Deflection Max: L/720

E. Test Results
   1. Manufacturer shall furnish test results attesting that materials meet specification requirements.

## 1.04 QUALITY ASSURANCE

A. Qualifications: Precast Concrete Manufacturer and Trade Contractor must have a minimum of 5 years of successful experience on projects of similar magnitude and complexity to the indicated project.

B. Manufacturer and contractor to be prequalified by Architect prior to bidding and failure to do so will void bid.

## 1.05 DELIVERY, STORAGE, AND HANDLING

A. Packaging and Shipping: precast concrete to be palletized, shrink wrapped and marked with legible manufacturer identification, including piece number and quantities.

B. Storage and Protection precast concrete to be stored in secure area in original packaging.

C. Protect from damage by other trades.

D. Report all damage due to shipment immediately. Customer is required to sign the Bill of Lading slip detailing the damaged product. Picture proof is required.

## 1.06 WARRANTY

A. For a period of two (2) years from delivery of precast concrete, manufacturer warrants the precast concrete products against defects in workmanship and materials per industry standards. This warranty does not cover the above products for cracking and faulting caused by settling due to improper or faulty substrates or improper installation; nor does it cover damage caused by impact, vandalism, or natural disaster.

## PART 2 – PRODUCTS

### 2.01 MANUFACTURERS

A. Acceptable Manufacturer:
   1. Wausau Tile, Inc. | 1.800.388.8728 | info@wausautile.com | www.wausautile.com

B. Clarification Note: Drawings and specifications are based on manufacturer's proprietary literature from Wausau Tile, Inc. Other manufacturers shall comply with minimum levels of material specifications and detailing indicated on the drawings of specified herein to be considered as an approved equal.

   1. Precast Benches shall be shapes and sizes indicated on the Drawings. Color and finish shall be as indicated on the Drawings.

### 2.02 MATERIAL REQUIREMENTS

A. Portland Cement: ASTM C-150 Specifications for Portland Cement.

B. Aggregates: Aggregate shall be blended to meet individual project requirements.

C. Coloring; Pigments used shall be inorganic, resistant to alkalinity and used per manufacturer's recommendations.

D. Reinforcement and Hardware:
   1. Reinforce precast with deformed rods as recommended by precast concrete manufacturer.

E. Abrasive Inserts: Shall consist of silica sand and epoxy.
   1. Abrasive Color: _____
   2. Specify one to three lines.
   3.

F. Setting Materials, Caulks & Sealants
   1. Color(s) to be selected by Architect.
   2. Sealer: Colorless, pure acrylic water-repellent sealer. Sealer to maintain natural look of concrete surface with no glaze or gloss, darkening or color change.
   3. Precast manufacturer is not a reseller for any of the above products. Please contact the following supplier for information and recommendations on job specific installation materials:
      a. Acceptable Supplier:
         Custom Building Products/Aqua Mix, 800-272-878
         E-mail: info@cbpmail.net Website: www.custombuildingproducts.com

## 2.03 MANUFACTURED UNITS

A. Sizing Tolerances
   1. All units to conform to shop drawings with a (+/-) 1/8" tolerance in dimension.

B. Precast Surfaces and Edges:
   1. All exposed edges to have minimum of 1/8" radius to prevent chipping.
   2. All finished surfaces to match approved control sample.
   3. All precast concrete finished surfaces to be factory sealed.

# PART 3 – EXECUTION

## 3.01 INSPECTION

A. Examine substrates for the following:
   1. Defects or cracks in existing work or substrate.
   2. Deviations beyond allowable tolerances for the substrate.

B. Continue with installation of precast units only when all defects have been corrected.

## 3.02 PROJECT CONDITIONS

A. Do not install products under environmental conditions outside setting material manufacturer's absolute limits.

## 3.03 EXECUTION

A. Precast setting methods include.
   1. Thin Set Application
      a. Substrate of concrete or steel (steel at interior application only). Must be within a tolerance of 1/8" in all dimensions.
      b. Latex modified thin set mortar used over concrete substrate.
      c. Setting bed must be continuous under the entire length of the tread and behind the entire riser. Setting materials utilized per manufacture's recommended instruction.
      d. Epoxy thin set is used over steel substrate.
      e. Setting bed must be continuous under the entire length of the tread and behind the entire riser. Setting materials utilized per manufacture's recommended instruction.
      f. Set treads level and plumb to meet finished nosing layout.

   2. Mortar Set Application
      a. Substrate of concrete slab or steel (steel at interior application only). Must be within a tolerance of 1/8" in all dimensions. Where slab is required, refer to Section 32 13 13.
      b. The height of the mortar bed is established based on tread nosing layout marks and precast thickness. The mortar bed is then placed or

screeded over primed substrate.
c. Setting bed must be continuous under the entire length of the tread and behind the entire riser. Setting materials utilized per manufacture's recommended instruction.
d. Set modules level and plumb to meet finished flush layout.

4. Tab Set Application
a. Substrate of concrete slab or steel (steel at interior application only) must be within a tolerance of 1/8"in all dimensions. Where slab is required, refer to Section 32 13 13.
b. Tabs to be set at front and back of tread every 12" O.C. minimum.
c. Set treads level and plumb to established nosing layout.

C. Joints
1. Joints between adjacent precast should be a minimum of 1/8”-1/4”.

D. Caulking of Precast
1. Clean all joints thoroughly, removing all debris.
2. Wipe all joints with caulk manufacturer's recommended cleaner prior to application.
3. Use urethane caulk. (Color match caulk to precast per architect selection.)
4. Clean up after caulking as per caulk manufacturer's recommendations.

E. Precast Concrete products setting, or installation methods are to be reviewed by the manufacturer and setting materials supplier.

F. Final Cleaning of Precast Concrete
1. Check all surfaces and caulking, make repairs as necessary.
2. Clean treads with a pH balanced soap.

G. Protection:
1. Upon completion, the work shall be ready for final inspection and acceptance by owner or owner’s agent.
2. General Contractor shall protect the finished work from the time the installing contractor completes the work.

H. Finish:
1. Overall match to approved sample and per industry standards.
2. All products to be factory sealed.

## PART 4 – CARE AND MAINTENANCE

### 4.01 CLEANING

A. To preserve the appearance and extend the life of the Precast Concrete cleaning and maintenance processes must be in place. When using the following procedures, please follow the product manufacturer's instructions regarding the use of any equipment or cleaning materials described here.
   1. Power sweep, then pressure wash precast surface. Spot clean any stained areas.
   2. Spot clean any stained areas by using a neutral, non-aggressive cleaner. This may require effort to remove some of the tougher marks or stains.
   3. Example of off-the-shelf cleaners: Citrus cleaner, Simple Green
   4. Always start with the most neutral cleaner and work your way toward the more aggressive cleaners.

B. In extreme cases, contact Tectura Designs to discuss options.
   1. Be sure to use plastic, rubber, or nylon tip equipment; this will help prevent scratches on the concrete.

C. Precast Concrete is built to withstand aggressive cleaning; however, the more aggressive the cleaner, the more risk is involved. Strict adherence to all product warnings is suggested.

D. In all cases after cleaning and/or patching, it is recommended that the Precast be sealed. This will help protect the product from environmental effects. Contact manufacturer to obtain sealer and stain information based on specific job.

## 4.02 MAINTENANCE

A. Annual maintenance is recommended; however, incases of extreme use, the best time for application is when the appearance of the product is showing wear or is appearing dull.

B. Check the precast for broken and chipped pieces. If damaged, contact manufacturer before repairing to order a patch kit and obtain patching procedures.

C. De-icing salts can damage concrete, causing them to scale or break apart. If necessary, these chemicals should be used sparingly and with caution on our concrete products.
   1. Salt based products are not recommended.

D. De-icers should be used only when necessary to help loosen snow and ice and make removal easier. Never over-apply de-icing products. Mix the de-icers with sand to increase their effectiveness and reduce overall use.
   1. Always read and follow label directions when applying de-icing materials.
   2. Calcium magnesium acetate chloride tends to cause the least amount of damage to Precast Concrete.

E. Other manufacturer’s products used in conjunction with the Precast Concrete may require additional maintenance. Including but not limited to: Wood, Metals, Plastics, etc. Contact product specific manufacturers for their maintenance requirements.

**END OF SECTION**

# SECTION 04 20 00

# UNIT MASONRY

## PART 1 – GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specifications Sections, apply to this section

### 1.2 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Mortar and grout.
3. Steel reinforcing bars.
4. Masonry joint reinforcement.
5. Tile and anchors.
6. Miscellaneous masonry accessories.
7. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) plastic pipe and fittings; 2002.

### 1.3 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

### 1.4 PERFORMANCE REQUIREMENTS

A. Provide structural unit masonry that develops indicated net-area compressive strengths at 28 days:

1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

## 1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For the following:

1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACO 315, “Details and Detailing of Concrete Reinforcement”.

C. Material Certificates: For each type and size of the following:

1. Masonry units.
   a. Include data on material properties material test reports substantiating compliance with requirements.
   b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of unit.
2. Cementitious materials. Include brand, type and name of manufacturer.
3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
4. Grout mixes. Include description of type and proportions of ingredients.
5. Reinforcing bars.
6. Joint reinforcement.
7. Anchors, ties, and metal accessories.

D. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specifications. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
2. Include test reports, according to AST C 1019, for grout mixes to comply with compressive strength requirement.

E. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determines according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

F. Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

## 1.6 QUALITY ASSURANCE

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture

and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

C. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

D. Preinstallation Conference: conduct conference at Project site.

## 1.7 DELIVERY, STORAGE AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

## 1.8 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day’s work. Cover partially completed masonry when construction is not in progress.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.

3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.

4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: do not use frozen materials or materials mixed with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

E. Hot-Weather Requirements: comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602

## PART 2 – PRODUCTS

### 2.1 MASONRY UNITS, GENERAL

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

### 2.2 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide square-edged units for outside corners unless otherwise indicated.

B. CMU's: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
2. Density Classification: Normal weight unless otherwise indicated.
3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.
5. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

### 2.3 CONCRETE AND MASONRY LINTELS

A. General: Provide one of the following:

B. Concrete Lintels: Formed-in-place concrete lintels complying with requirements in Section 033000 “Cast-in-Place Concrete,” and with reinforcing bars as indicated.

## 2.4 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II. Provide natural color or white cement as required to product mortar color indicated.

1. Alkali content shall not be more than 0.1 percent when testing according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of Portland cement and hydrated lime containing no other ingredients.

D. Masonry Cement: ASTM C91.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the work include, but are not limited to, the following:

a. Capital Materials Corporation; Flamingo Color Masonry Cement.
b. Cemex S.A.B. de C.V; Brikset Type N Citadel Type S Dixie Type S Kosmortar Type N Richmortar Victor Plastic Cement.
c. Essroc, Italcementi Group; Brixment or Velvet.
d. Holcim (US) Inc; Mortamix Masonry Cement Rainbow Mortamix Custom Buff Masonry Cement with Mortamix Masonry Cement.
e. Lafarge North America Inc; Magnolia Masonry cement Lafarge Masonry Cement Trinity White Masonry Cement.
f. Lehigh Cement Company; Lehigh Masonry Cement Lehigh White Masonry Cement.
g. National cement Company, Inc; Coosa Masonry Cement.

E. Mortar Cement: ASTMC 1329

1. Products: Subject to compliance with requirements, available products that maybe incorporated into the Work include, but are not limited to, the following:

a. Lagarge North America Inc; Lafarge Mortar Cement or Magnolia Superbond Mortar cement.

F. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, used washed aggregate consisting of natural sand or crushed stone.

G. Aggregate for Grout: ASTM C 404.

H. Water: Potable

## 2.5 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 (Grade 420).

B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.

1. Hot-dip galvanized, carbon steel.
2. Wire size for Side Rods: 0.148-inch (3.77-mm) diameter.
3. Wire Size for Cross Rods: 0.148-inch (3.77-mm) diameter.
4. Spacing of Cross Rods, Tabs and Cross Ties: Nor more than 16 inches (407mm) o.c.
5. Provide in lengths of not less than 10 feet (3m), with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Ladder type with single pair of side rods.

## 2.6 TIES AND ANCHORS

A. General: Ties and anchors shall extend at least 1-1/2 inches (38 mm) into masonry but with at least a 5/8-inch (16-mm) cover on outside face.

B. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
2. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 (Z180) zinc coating.
3. Steel Sheet, Galvanized after Fabrication; ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
4. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Corrugated Metal Ties: Metal strips not less than 7.8 inch (22 mm) wide with corrugations having a wavelength of 7.6 to 12.7 mm and an amplitude of 0.06 to 0.10 inch (1.5 to 2.5 mm) made from 0.0060-inch-(1.52-mm-) thick, steel sheet, galvanized after fabrication with dovetail tabs for inserting into dovetail slots in concrete.

## 2.7 MISCELLANEOUS ANCHORS

A. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch (3.77-mm) steel wire, hot-dip galvanized after fabrication. Provide units

designed for number of bars indicated.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
    b. Heckmann Building Products Inc; No. 376 Rebar Positioner.
    c. Hohmann & Barnard, Inc. #RB or #RB-Twin Rebar Positioner.
    d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

## 2.8 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

    1. Do not use calcium chloride in mortar or grout.
    2. Use Portland cement-lime masonry cement or mortar cement mortar unless otherwise indicated.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion or Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.

    1. Use Type M or Type S.

D. Grout for Unit Masonry: Comply with ASTM C 476.

    1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
    2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 3000 psi (21 MPa)
    3. Provide grout with a slump of 8 to 11 inches (203 to 279 mm) as measured according to ASTM C 143/C 143M.

## PART 3 – EXECUTION

### 3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerance and other conditions affecting performance of the Work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION, GENERAL

A. Thickness: Build walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections, but only as indicated in the structural drawings or as approved by Engineer in advance.

C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

D. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

### 3.3 TOLERANCES

A. Dimensions and Locations of Elements:

1. For location of elements in plan do not vary from that indicated by more than plus or minus ½ inch (12 mm).
2. For location of elements in elevation do not vary from that indicated by more than plus or minus ¼ inch (6mm) in a story height of ½ inch (12 mm) total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls do not vary from level by more than ¼ inch in 10 feet (6mm in 3 m), or ½ inch (12 mm) maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet (3 mm in 3 m), ¼ inch in 20 feet

(6mm in 6m), or ½ inch (12 mm) maximum.

3. For vertical lines and surfaces do not vary from plumb by more than ¼ inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (9mm in 6 m), or ½ inch (12 mm) maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet (3 mm in 3 m), ¼ inch in 20 feet (6 mm in 6 m), or ½ inch (12 mm) maximum.
5. For lines and surfaces do not vary from straight by more than ¼ inch in 10 feet (6 mm in 3 m), or ½ inch (12 mm) maximum.
6. For vertical alignment of exposed head joints, do not very from plumb by more than ¼ inch in 10 feet (6 mm in 3 m), or ½ inch (12 mm) maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch (1.5 mm) except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to ½ inch (12 mm).
2. For exposed bed joints, do not vary from bed-joint thickness adjacent courses by more than 1/8 inch (3 mm).
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch (9 mm) or minus ¼ inch (6 mm).
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch (3 mm). Do not vary from adjacent bed-joint and head-joint thickness by more than 1/8 inch (3 mm).
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch (1.5 mm) from one masonry unit to the next.

## 3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Masonry: Unless otherwise indicated, lay exposed masonry in running bond, stack bond, bond pattern indicated on Drawings; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.

C. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

D. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into

core.

E. Fill cores in hollow CMUs with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

## 3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs as follows:

1. With face shells fully bedded in mortar and with head joints of depth equals to bed joints.
2. With webs fully bedded in mortar in grouted masonry, including starter course on footings.
3. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and show into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer lager than joint thickness unless otherwise indicated.

D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

E. Cut joints flush where indicated to receive waterproofing unless otherwise indicated.

## 3.6 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on exterior side of walls, ½ inch (13 mm) elsewhere. Lap reinforcement a minimum of 6 inches (150 mm).

1. Space reinforcement not more than 16 inches (406 mm) o.c.
2. Provide reinforcement not more than 8 inches (203 mm) above and below wall openings and extending 12 inches (305 mm) beyond openings in addition to continuous reinforcement.

B. Provide continuity at wall intersections by using prefabricated T-shaped units.

C. Provide continuity at corners by using prefabricated L-shaped units.

D. Cuts and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, and other special conditions.

## 3.7 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches (1520 mm).

## 3.8 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at contractor's expense.

B. Inspections: Special inspections according to Florida Building Code.

1. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.

C. Testing Frequency: one set of tests for each 5000 sq. ft. (464 sq. m) of wall area or portion thereof.

D. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

E. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

F. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for compressive strength.

G. Grout Test (Compressive Strength): For each mix provided, according to ASTM C1019.

## 3.9 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

## 3.10 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
B. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

**END OF SECTION**

# SECTION 05 05 13
# SHOP-APPLIED COATINGS FOR METAL

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:
1. Shop-applied coatings for architectural metals.

B. Related Sections:
2. Division 01 Section “Sustainable Design Requirements.”
3. Division 05 Section “Pipe and Tube Railings.”
4. Division 05 Section “Decorative Metal.”
5. Division 05 Section “Decorative Metal Railings.”
6. Division 05 Section “Decorative Formed Metal.”
7. Division 07 Section “Sheet Metal Flashing and Trim.”
8. Division 07 Section “Roof Specialties.”
9. Division 08 Section “Aluminum-Framed Entrances and Storefronts.”
10. Division 08 Section “Louvers and Vents.”
11. Division 10 Section “Metal Lockers.”
12. Division 13 Section “Metal Building Systems.”

### 1.2 REFERENCES

A. American Architectural Manufacturers Association (AAMA):
1. AAMA 621 - Voluntary Specification for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Steel Substrates.
2. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
3. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions.
4. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions.
5. AAMA 643 – Voluntary Specification, Performance Requirements and Test Procedures for Solar Reflectance Finishes.

B. ASTM International (ASTM):
6. ASTM B 117 - Practice for Operating Salt Spray (Fog) Apparatus.
7. ASTM G 85 annex 5 – Modified Salt Spray Cyclic Fog Test.
8. ASTM D 7091 - Standard Test Method for Nondestructive Measurement of Dry Film Thickness of
9. Nonconductive Coatings Applied to a Nonferrous Metal Base.
10. ASTM D 1654 - Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
11. ASTM D 2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
12. ASTM D 2247 - Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
13. ASTM D 3363 - Standard Test Method for Film Hardness by Pencil Test.
14. ASTM D 4214 - Test Methods for Evaluating Degree of Chalking of Exterior Paint Films.

15. ASTM E 1980 - Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.

C. US Green Building Council (USGBC): LEED Green Building Rating System NC (New Construction) version 4.

## 1.3 PERFORMANCE REQUIREMENTS

A. Solar Reflective Index (SRI): Provide metal roof panel coatings with an initial SRI of not less than 82 or a 3-year aged SRI of 64 for slopes of 2:12 or less, and an initial SRI of 39 or a 3-year aged SRI of 32 for slopes greater than 2:12, per ASTM E 1980.

B. ENERGY STAR Compliance: Provide metal roof panel coatings identical to those listed on U.S. Department of Energy's ENERGY STAR Roof Products Qualified Product List.

C. CEC-Title 24 Compliance: Provide metal roof panel coatings with initial solar reflectance not less than 0.70 and emissivity not less than 0.75 per CRRC-1.

## 1.4 SUBMITTALS

A. Product Data: For each type of coating product specified.
B. Samples for Selection: For each color, gloss specified.
C. Samples for Verification: For each coating product, for each color, gloss and texture specified, on specified substrate.
D. Product test reports.
E. Qualifications: For shop-applied coatings Applicator.
F. Maintenance data.
G. Warranty: Sample of special warranty.

## 1.5 QUALITY ASSURANCE

A. Applicator Qualifications: Coating manufacturer's approved certified applicator, equipped, trained and approved for application of coatings required for this Project, and is approved to provide warranty specified in this Section.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, unload and store shop-coated items so that they remain free of damage or deformation. Package and protect items during shipping and handling. Protect stored items from water; stack to facilitate drainage. Keep shop-coated items out of contact with materials that may adversely affect the coating.
B. Protect shop-coated items with protective covering until installed.

## 1.7 COORDINATION

A. Coordinate submittal and selection procedures for items to receive shop-applied coatings. Where items are indicated to match coatings selected for other items, adjust formulations as required to achieve match. Submit samples for verification indicating compliance with matching requirements.

## 1.8 WARRANTY

A. Coating Warranty: Coating Applicator's warranty in which Applicator agrees to repair finish or

replace coated items that demonstrate deterioration of shop-applied finishes within warranty period indicated.

B. Exposed Coating: Deterioration includes but is not limited to:
   1. Color fading in excess of 5 Delta E Hunter units per ASTM D 2244.
   2. Peeling, checking or cracking of coating adhesion to metal.
   3. Chalking in excess of a No. 8 per ASTM D 4214, when tested per Method D 659.
   4. Corrosion of substrate in excess of a No. 6 on cut edges and a No. 8 on field surfaces, when measured per ASTM D 1654.

C. Warranty Period: 30 years from date of substantial completion.

## PART 2 – PRODUCTS

### 2.1 MANUFACTURERS

A. Basis-of-Design Product: Shop-applied coatings manufactured by PPG, Pittsburgh, PA; (888) 774-4332; Website: www.ppgmetalcoatings.com

B. or comparable products of another manufacturer approved by Architect prior to bid.

### 2.2 APPROVED COATING APPLICATORS

A. Acceptable Applicators: Provide shop-applied coatings applied by one of the following manufacturer- approved manufacturer-certified applicators:

   1. PPG.
   2. Approved equal.

### 2.3 HIGH-PERFORMANCE ORGANIC TOUCH UP AND RESTORATION FINISH MATERIALS

A. Liquid Fluoropolymer Touch up coatings, AAMA 2605 - large touch up and restoration:

Primer: PPG Coraflon ADS 573 Series Coraflon ADS Epoxy Intermediate Primer; 2.0-5.0 mils dft. (Not Compliant in SCAQMD.)

Finish: PPG Coraflon ADS; 1.5-2.3 mils dft. (Not Compliant in SCAQMD.) Apply per instructions on the technical data bulletin. Metallic finishes may require an additional clear coat of Coraflon ADS.

*Existing caulk, sealant, and residue/contamination to be completely removed* from substrate to be coated by means deemed appropriate by contractor. Do not coat over caulking. If caulking is not removed, and is painted up to caulking, coating subject to delamination along caulk edge.

1. Surface Preparation: Solvent Clean, per SSPC SP-1, the substrate to remove any contamination that may be present, including any silicone residue and chlorides.

   Abrade substrate, similar to SSPC-SP-2/3, to remove any loose factory coatings and field applied coatings, sheen, contamination, while creating a minimum surface profile of 1.0 mil. on both any bare metal and coated substrates.

   i. Corroded Surface: Prepare any corrode surfaces similar to per SSPC SP-15, Commercial Grade Power Tool Cleaning, removing existing coatings, rust, oxides, mill scale, while obtaining a surface profile of 1.5 to 2.0 mils. Feather sand edges. **Prime the same day to avoid oxidation.** Apply one coat of Coraflon ADS 511/512 Primer, using multiple passes spraying, @ 3.0 – 5.0 mils DFT. May require multiple passes or coats to achieve recommended dft. All edges and bolts to be stripe coated.

2. Prior to coating, solvent wipe or “tack” off substrate to remove dust and residual

contamination. Before each coating operation, surface will be clean, dry, contamination free.

3. Primer**:** Apply one coat of Coraflon ADS 511/512 Primer, using multiple passes spraying, @ 2.0 – 3.0 mils DFT. May require multiple passes or coats to achieve recommended dft. All edges and bolts to be stripe coated.

4. Product: Coraflon Intermix**-**Color Permitting. Gloss or Satin Finish Apply one coat of Coraflon ADS, using multiple passes spraying @ 1.8 – 2.2 mils DFT. May require multiple passes or coats to achieve recommended dft. All edges and bolts to be stripe coated.

5. Product: Coraflon™ ADS Metallic coatings require a clear finish coat. The clear coat protects the aluminum pigmentation from ultra-violet degradation. Allow metallic topcoat to dry 4 hours minimum before top coating. Light Mica colors may require a barrier coat ADS564 @1.5 to 2.2 mils DFT. Coastal Environments may require a Coraflon Clear Coat. Micas and Metallic colors are conventional spray application.

## PART 3 - EXECUTION

**3.1** INSTALLATION

A. Refer to individual specifications sections for installation requirements for items receiving shop-applied coatings.

**3.2** PROTECTION

A. Remove protective wrap from coated items at time of installation.

END OF SECTION

SECTION 05 12 00
STRUCTURAL STEEL

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Structural steel framing members
B. Base plates, and shear stud connectors
C. Grouting under base plates

1.2 REFERENCES

A. AISC - Code of Standard Practice for Steel Buildings and Bridges
B. AISC –Steel Construction Manual
C. AISC - Specification for Structural Steel Buildings
D. ASCE 7 - American Society of Civil Engineers – Minimum Design Loads of Buildings and Other Structures
E. ASTM A992 – Standard Specification for Structural Steel Shapes
F. ASTM A36, Standard Specification for Carbon Structural Steel
G. ASTM A1085500 - Standard Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes
H. ASTM A108 - Standard Specification for Steel Bars, Carbon, and Alloy, Cold-Finished
I. ASTM A123/A123M - Standard Specification for Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products
J. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware
K. ASTM A307 - Standard Specification for Carbon Steel and Studs, 60 000 PSI Tensile Strength
L. ASTM A325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength
M. ASTM A449 – Standard Specification for Hex Cap Screws, Bolts, and Studs, Steel, Heat Treated, 120/105/90 ksi Minimum Tensile Strength, General Use
N. ASTM A490 - Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
O. AWS D1.1/D1.1M - Structural Welding Code
P. FM - Roof Assembly Classifications
Q. SSPC (Steel Structures Painting Council) - Paint Manual
R. UL - Fire Resistance Directory
S. FBC - Florida Building Code

1.3 SUBMITTALS FOR REVIEW

A. Section 01 33 00 - Submittals Procedures
B. Shop Drawings:

1. Indicate profiles, sizes, spacing, and locations of structural members, openings, attachments, and fasteners.
2. State of Florida signed and sealed connection designs
3. Cambers and loads
4. Indicate welded connections with AWS A2.4 welding symbols, along with net weld lengths.
5. Indicate grade of steel.
6. State of Florida Professional Engineer shall date, sign, and seal the required Shop Drawings including all steel connections.

1.4 SUBMITTALS FOR INFORMATION

A. Section 01 33 00 - Submittals Procedures
B. Manufacturer's Mill Certificate: Certify that Products meet or exceed specified requirements.
C. Mill Test Reports: Submit indicating structural strength, destructive and non-destructive test analysis.
D. Welders' Certificates: Certify welders employed on the Work, verifying AWS qualifications within the previous 12-months.

1.5 QUALITY ASSURANCE

A. Fabricate structural steel members in accordance with AISC Code of Standard Practice.
B. Maintain one copy of each document on site.
C. Fabricator: Company specializing in performing the work of this section with minimum five years documented experience.
D. Erector: Company specializing in performing the work of this section with minimum 5-years documented experience.
E. State of Florida Professional Structural Engineer experienced in design of connection details shall design all connections not detailed on the plans from the Architect/Engineer of record.

1.6 REGULATORY REQUIREMENTS

A. Structural steel design and construction shall comply with FBC, ASCE 7 – Wind loads, and American Institute of Steel Construction, AISC "Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings."
B. Conform to UL, FM, and Warnock Hersey Assembly.

1.7 DELIVERY, STORAGE AND PROTECTION

A. Section 01 60 00 - Materials Equipment and approved equals: Transport, handle, store and protect product

PART 2 PRODUCTS

2.1 MATERIALS

A. Steel Sections: ASTM A992, grade 50 for W and WT sections
B. Steel Tubing: ASTM A1085, Grade C for square, rectangular and round HSS sections.
C. Structural Steel Members: ASTM A36, grade 36 for angles, channels, and plates.
D. Shear Stud Connectors: ASTM A108, Grade 1015, headed, uncoated
E. Bolts, Nuts, and Washers: ASTM A307, A325 and A490 galvanized to ASTM A153/A153M for galvanized members
F. Anchor Bolts: ASTM F1554, grade 36
G. Welding Materials: AWS D1.1; type required for materials being welded
H. Sliding Bearing Plates: Teflon coated
I. Grout: Use non-shrink type, pre-mixed compound consisting of non-metallic aggregate, cement, water reducing, and plasticizing additives, capable of developing a minimum compressive strength of 7,000 psi at 28 days.
J. Shop and Touch-Up Primer: SSPC Paint 15, Type 1, provide a uniform dry film thickness of 1.5 mils
K. Touch-up Primer for Galvanized Surfaces: SSPC 20 Type I Inorganic

2.2 FABRICATION

A. Continuously seal joined members by intermittent welds and plastic filler.
   1. Grind exposed welds smooth.
B. Fabricate connections for bolt, nut, and washer connectors.
C. Develop required camber of members.

2.3 FINISH

A. Prepare structural component surfaces in accordance with SSPC SP-2.
B. Shop prime structural steel members
   1. Do not prime surfaces receiving fireproofing or field welds.
   2. Do not prime surfaces in contact with concrete.
   3. Do not prime surface of high strength bolts.
C. Galvanize structural steel members to ASTM A123/A123M; provide minimum 1.25 oz/sq ft galvanized coating.
D. All structural or miscellaneous steel exposed to earth or weather shall be hot dipped galvanized (G90).

2.4 SOURCE QUALITY CONTROL AND TESTS

A. Provide shop testing and analysis of structural steel sections.

PART 3 EXECUTION

3.1 EXAMINATION

A. Section 01 31 00 – Project Management and Coordination: Verification of existing conditions prior to beginning work

## 3.2 ERECTION

A. Allow for erection loads, and sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.
B. Field-weld components and shear studs indicated on shop drawings.
C. Field-connect members with threaded fasteners; torque to required resistance.
D. Do not field cut or alter structural members without approval of A/E.
E. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.
F. Grout under base plates. Trowel grouted surface smooth, splay neatly to 45°.
G. Provide nuts and lock washers for the connection of the kitchen hood hangers.
H. Do not hang ceilings, pipes, etc. from metal deck.
    1. Attach anchors to the top chord of steel truss/joist.
    2. Only loads approved by structural engineer of record as shown on the structural drawings may be attached to the bottom cord of the truss or joist.
I. Provide protection of structural steel from corrosion – base plates, anchor angles embedded in concrete or soil.
J. Attach structural steel trusses to supports with either welds or bolts.

## 3.3 ERECTION TOLERANCES

A. Maximum Variation From Plumb: ¼" per story, non-cumulative
B. Maximum Offset from True Alignment: ¼"

## 3.4 FIELD QUALITY CONTROL

A. Section 01 40 00 - Quality Control: The District may require field inspection, testing of bolt torque, welds and torque of fasteners.

END OF SECTION

# SECTION 05 40 16
# CUSTOM-CURVED COLD FORMED METAL FRAMING

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. All cold formed metal framing materials and services for cold formed metal framing for curved and/or complex (geometry) walls, soffit, and ceilings.

B. Include all required primary, secondary, and tertiary framing components for a complete assembly.

C. Custom-Curved Cold formed metal framing is per the construction documents.

### 1.2 RELATED REQUIREMENTS

A. Section 05 40 00 - Cold Formed Metal Framing

B. Section 05 31 00 - Structural Steel Framing

### 1.3 REFERENCE STANDARDS

A. ASTM A 780 – Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

B. ASTM A1003/A 1003M Standard Specification for Steel Sheet, Carbon, Metallic- and – Nonmetallic-Coated for Cold-Formed Framing Members.

C. ASTM C955 Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.

D. ASTM C 1513 – Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.

E. ASTM E 329 – Standard Specification for Agencies Engaged in Construction Inspection and/or Testing.

F. AISI S100 Series North American Standards for Cold-Formed Steel Framing.

G. AISI S200 Series North American Standards for Cold-Formed Steel Framing – General Provisions.

H. AISI S210 – North American Standard for Cold-Formed Steel Framing – Floor and Roof System Design.

I. AISI S211 – North American Standard for Cold-Formed Steel Framing – Wall Stud Design.

J. AISI S212 – North American Standard for Cold-Formed Steel Framing – Header Design.

K. AISI S213 – North American Standard for Cold-Formed Steel Framing – Lateral Design.

L. AWS D1.1/D1.1M – Structural Welding Code – Steel.

M. AWS D1.3/D1.3M – Structural Welding Code – Sheet Steel

### 1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with work of other sections that is to be installed in or adjacent to the metal framing system, including but not limited to structural anchors, cladding anchors, utilities, insulation, and firestopping.

### 1.5 SUBMITTALS

A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturer's data on factory-made framing connectors, showing compliance with requirements.

C. Building Information Model Shop Drawings: Indicate codes, assumed loadings, component details, layout, sizes, types and details, including framed openings, bearing, anchorage, loading, welds, type and location of fasteners, and connections, and accessories or items required of related work.

1. Indicate stud and ceiling ~~joist~~ [concrete slab attachment] layout.
2. Describe method for securing studs to tracks and for bolted framing connections.
3. Design data:
   a. Shop drawings signed and sealed by a professional structural engineer. Indicate loading, dead loads, calculations, for all conditions, framing, lintels, etc.
4. See Section 01 31 21 - BIM Coordination DR
5. Drawings for additional requirements.
6. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention

### 1.6 QUALITY ASSURANCE

A. Designer Qualifications: Design framing system under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located.

B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, and with minimum three years of documented experience.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

A. Custom-Curved Cold Formed Metal Framing:

a. Radius Track Corporation

i. 3340 Winpark Drive

ii. Minneapolis MN. 55427

iii. Contact: 763-795-8885

iv. Info@radiustrack.com

B. Requests for substitutions will be considered in accordance with provisions of Division 01 and must be Approved by the Architect.

### 2.2 FRAMING SYSTEM

A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

B. Design Requirements: Provide completed framing system per construction documentation.

1. Design: Calculate structural characteristics of cold-formed steel framing

members according to AISI S100-12.

2. Structural Performance: Design, engineer, fabricate, and erect to withstand specified design loads for project conditions within required limits.
3. Design Loads: In accordance with applicable codes.
4. Live load deflection meeting the following, unless otherwise indicated:
    a. Floors: Maximum vertical deflection under live load of 1/480 of span.
    b. Roofs: Maximum vertical deflection under live load of 1/360 of span.
    c. Exterior Walls: Maximum horizontal deflection under wind load of 1/360 of span.
5. Able to tolerate movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
6. Able to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

## 2.3 FRAMING MATERIALS

A. Studs and Track: per ASTM standards.
    1. Gage and Depth: As required to meet specified performance levels.

B. Framing Connectors: Factory-made, formed steel sheet.
    1. Material: ASTM A653/A653M SS Grade 33 and 40 (minimum), with G90/Z275 hot dipped galvanized coating for base metal thickness less than 10 gage, 0.1345 inch, and factory punched holes and slots.
    2. Structural Performance: Maintain load and movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
    3. Movement Connections: Provide mechanical anchorage devices that accommodate movement using slotted holes, shouldered screws or screws and anti-friction or stepped bushings, while maintaining structural performance of framing. Provide movement connections where indicated on drawings.
        a. Where continuous studs bypass elevated floor slab, connect stud to slab in manner allowing vertical and horizontal movement of slab without affecting studs; allow for minimum movement of 1/2 inch.
        b. Where top of stud wall terminates below structural floor or roof, connect studs to structure in manner allowing vertical and horizontal movement of slab without affecting studs; allow for minimum movement of 1/2 inch.
        c. Provide top track preassembled with connection devices spaced to fit stud spacing indicated on drawings; minimum track length of 10 feet.
    4. Fixed Connections: Provide non-movement connections for tie-down to foundation, floor-to-floor tie-down, roof-to-wall tie-down, joist hangers, gusset plates, and stiffeners.
    5. Wall Stud Bridging Connections: Provide mechanical load-transferring devices that accommodate wind load torsion and weak axis buckling induced by axial compression loads. Provide bridging connections where indicated on the drawings.

## 2.4 FASTENERS

A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: per ASTM A153/A153M.

B. Anchorage Devices: Per Deferred Submittal

C. Welding: Comply with AWS D1.1/D1.1M.

## 2.5 WALL SHEATHING

A. Plywood; PS 1, Grade C-D, Exposure I.

B. Glass mat faced gypsum board; ASTM C1177/C1177M, square long edges, 5/8 inch thick, Type X - Fire Resistant.

### 2.6 ACCESSORIES

A. Bracing, Furring, Bridging: As required; finish to match framing components.

## PART 3 EXECUTION

### 3.1 EXAMINATION

A. Examine substrate for suitability to accept work.

B. Verify field measurements and adjust installation as required.

C. Start of work constitutes acceptance of substrate and responsibility for performance.

### 3.2 INSTALLATION - GENERAL

A. Install cold-formed metal framing in accordance with AISI S 200, manufacturer's instructions, and approved shop drawings.

B. Install shop fabricated framing assemblies and anchor to supporting structure.

C. Install assemblies plumb, level, square and true to line and located as indicated on shop drawings.

D. Align adjacent assemblies to maintain uniform plane and joints between assemblies.

E. Install cold formed metal framing and accessories plumb level, square, and true to line; located as indicated on shop drawings, and with connections securely fastened.

F. Cut framing by sawing or shearing.

G. Secure framing by fastening or welding

H. Reinforce and brace framing as required to meet performance requirements for completed installation.

I. Install framing members in single piece lengths unless splice connections are indicated.

### 3.3 PROTECTION

A. Protect erected wall and openings with temporary covers until finish, roofing, flashing, and windows are installed.

### 3.4 TOLERANCES

A. Maximum Variation from True Position: 1/4 inch.

B. Maximum Variation of any Member from Plane: 1/8 inch.

C. Radius: Plus or minus 1/8 inch in 16 feet.

D. Radius Uniformity: Plus or minus 1/16 inch in 32 inches.

E. Arc Length: Plus or minus 1/8 inch.

F. Tangent Points: 1/16 within 16 inches.

G. Ellipses and other Multiple Radius Curves: Same as above for single radius curves.

**END OF SECTION**

# SECTION 05 50 00

# METAL FABRICATIONS

## PART 1 – GENERAL

### 1.1 SECTION INCLUDES

A. Shop fabricated steel and aluminum items.

B. Section Includes:

1. Pipe and fittings, valves, sprinkler heads, emitters, bubblers, and accessories.
2. Control system.

### 1.2 RELATED REQUIREMENTS

A. Section 04 20 00 – Unit Masonry: Placement of metal fabrications in masonry.

B. Section 05 52 13 – Pipe and Tube Railings.

C. Section 09 90 00 – Painting and Coating: Paint Finish

### 1.3 REFERENCE STANDARDS

A. AAMA 611 – Voluntary Specifications for Anodized Architectural Aluminum; American Architectural Manufacturers Association; 2012.

B. ANSI A14.3 – American National Standard for Ladders –Fixed—Safety Requirements; 2008.

C. ASTM A36/A36M – Standard Specification for Carbon Structural Steel; 2008.

D. ASTM A123/A123M – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2012.

E. ASTM A153/A153M – Standard Specification for Zinc Coasting (Hot-Dip) on Iron and Steel Hardware: 2009.

F. ASTM A283/A283M – Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates; 2012.

G. ASTM A500/A50M – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2010a.

H. ASTM A501 – Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2007.

I. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron-Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2011.

J. ASTM B209 – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2010.

K. ASTM B210 – Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless tubes; 2012.

L. ASTM B211 – Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire; 2012e1.

M. ASTM B221 – Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Wire, Profiles, and Tubes; 2012.

N. AWS A2.4 – Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society; 2012.

O. AWS D1.1/D1.1M – Structural Welding Code – Steel; American Welding Society; 2010.

P. AWS D1.2/D1.2M – Structural Welding Code – Aluminum; American Welding Society; 2008.

Q. IAS AC172 – Accreditation Criteria for Fabricator Inspection Programs for Structural Steel; International Accreditation Service, Inc.; 2011.

R. SSPC-Paint 15 – Steel Joist Shop Primer; Society for Protective Coatings; 1999 (Ed. 2004).

S. SSPC-Paint 20 – Zinc-Rich Primers (Type I, “Inorganic,” and Type II, “Organic”); Society for Protective Coatings, 2002 (Ed. 2004).

T. SSPC-SP2 – Hand Tool Cleaning; Society for Protective Coatings; 1982 (Ed. 2004).

## 1.4 SUBMITTALS

A. See Section 01 33 00 for submittal procedures.

B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.

2. Provide designer engineer's stamp on shop drawings.

C. Fabricator's Qualification Statement: Provide documentation showing steel fabricator is accredited under IAS AC 172.

### 1.5 QUALITY ASSURANCE

A. Designed to be performed under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in Florida.

B. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel (AC172).

## PART 2 – PRODUCTS

### 2.1 MATERIALS – STEEL

A. Steel Sections: ASTM A36/A36M.

B. Steel Tubing: ASTM A501 hot-formed structural tubing.

C. Plates: ASTM A283.

D. Bolts, Nuts, and Washers: ASTM F738M – 2008.

E. Welding Materials: AWS D1.1/D1.1M; type required for materials being welded.

F. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

G. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I – Inorganic, complying with VOC limitations for authorities having jurisdiction.

### 2.2 MATERIALS – ALUMINUM

A. Extruded Aluminum: ASTM B221 (ASTM B221M), 6063 alloy, T6 temper.

B. Sheet Aluminum: ASTM B209 (ASTM B209M), 5052 alloy, H32 or H22 temper.

C. Bolts, Nuts, and Washers: Stainless steel.

D. Welding Materials: AWS D1.2/D1.2M; type required for materials being welded.

### 2.3 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.
B. Fabricate items with joints tightly fitted and secured.

C. Continuously seal joined members by continuous welds.
D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush and hairline. Ease exposed edges to small uniform radius.
E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

### 2.4 FABRICATED ITEMS

A. Ladders: Steel; in compliance with ANSI A14.3; with mounting brackets and attachments: prime paint finish.
   1. Side Rails: 3/8 x 2 inches (9 x 50 mm) members spaced at 20 inches (500 mm).
   2. Rungs: one-inch (25 mm) diameter solid round bar spaced 12 inches (300 mm) on center.
   3. Space rungs 7 inches (175 mm) from wall surface.

### 2.5 FINISHES – STEEL

A. Follow section 09 90 00 – Paints and Coatings for Metal

### 2.6 FINISHES – ALUMINUM

A. Follow section 05 05 13 – Shop-Applied Coatings for Metal.

B. Exterior Aluminum Surfaces: Class I color anodized.

C. Interior Aluminum Surfaces: Class I natural anodized.

D. Class I Natural Anodized Finish: AAMA 611 AA-M12C22A41 Clear anodic coating not less than 0.7 mils (0.018 mm) thick.

### 2.7 FABRICATION TOLERANCES

A. Squareness: 1/8 inch (3 mm) maximum difference in diagonal measurements.

B. Maximum Offset Between Faces: 1/6 inch (1.5 mm).

C. Maximum Misalignment of Adjacent Members: 1/16 inch (1.5 mm).

D. Maximum Bow: 1/8 inch (3 mm) in 48 inches (1.2 m)

E. Maximum Deviation from Plane: 1/16 inch (1.5 mm) in 48 inches (1.2 m).

## PART 3 EXECUTION

### 3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

## 3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply setting templates to the appropriate entities for steel items required to be cast into
concrete or embedded in masonry.

## 3.3 INSTALLATION

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

B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

C. Perform field welding in accordance with AWS D1.1/D1.1M.

D. Obtain approval prior to site cutting or making adjustments not scheduled.

E. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

## 3.4 TOLERANCES

A. Maximum Variation from Plumb ¼ inch (6 mm) per story, non-cumulative.

B. Maximum Offset from True Alignment: ¼ inch (6 mm).

C. Maximum Out-of-Position: ¼ inch (6 mm).

**END OF SECTION**

# SECTION 05 52 00

# ALUMINUM HANDRAILS AND RAILINGS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions, Division 01 - General Requirements, and other applicable specification sections in the Project Manual apply to the work specified in this Section.

### 1.2 SUMMARY

A. Scope: Provide design and engineering, labor, material, equipment, related services, and supervision required, including, but not limited to, manufacturing, fabrication, erection, and installation for aluminum handrails and railings as required for the complete performance of the work, and as shown on the Drawings and as herein specified.

B. Section Includes: The work specified in this Section includes, but shall not be limited to, the following:

1. Aluminum lifesafety railings as noted in the drawings.

C. Related Sections:
1. Section 05 70 00 - Decorative Metal: Adjacent or adjoining handrails and railings fabricated from steel pipe and tube components.

### 1.3 REFERENCES

A. General: The publications listed below form a part of this Specification to the extent referenced. The publications are referred to in the text by the basic designation only. The edition/revision of the referenced publications shall be the latest date as of the date of the Contract Documents, unless otherwise specified.

B. Aluminum Association, Inc. (AA):
1. AA SAS-30, "Specifications for Aluminum Structures."

C. American Architectural Manufacturers Association (AAMA):
1. AAMA 611, "Voluntary Specifications for Anodized Architectural Aluminum (Revised)."
2. AAMA 2604, "Voluntary Specification, Performance Requirements, and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels."

3. AAMA 2605, "Voluntary Specification, Performance Requirements, and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels."
4. AAMA Aluminum Curtain Wall Series No. 12, "Structural Properties of Glass."

D. American Iron and Steel Institute (AISI):
1. AISI SG-673, Part I, "Specification for the Design of Cold-Formed Steel Structural Members."

E. American Welding Society (AWS):
1. AWS D1.2, "Structural Welding Code – Aluminum."

F. ASTM International (ASTM):
1. ASTM B26/B26M,"Standard Specification for Aluminum-Alloy Sand Castings."
2. ASTM B209/B209M,"Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate."
3. ASTM B210/B210M, "Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes."
4. ASTM B221/B221M, "Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes."
5. ASTM B247/B247M, "Standard Specification for Aluminum and Aluminum-Alloy Die Forgings, Hand Forgings, and Rolled Ring Forgings."
6. ASTM B429/B429M, "Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube."
7. ASTM C1048, "Standard Specification for Heat-Treated Flat Glass - Kind HS, Kind FT Coated and Uncoated Glass."
8. ASTM C1107, "Standard Specification for Packaged Dry, Hydraulic Cement Grout (Non-Shrink)."
9. ASTM E488, "Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements."
10. ASTM E985, "Standard Specification for Permanent Metal Railing Systems and Rails for Buildings."

G. Code of Federal Regulation (CFR):
1. 16 CFR Part 1201, "Safety Standard for Architectural Glazing Material" (Consumer Products Safety Commission).

H. National Association of Architectural Metal Manufacturers (NAAMM):
1. NAAMM MFM, "Metal Finishes Manual."

## 1.4 DEFINITIONS

A. See definitions in ASTM E985 for railing-related terms that apply to this Section.

## 1.5 PERFORMANCE REQUIREMENTS

A. General: Handrails and railings shall withstand structural loading as determined by allowable design working stresses of materials based on the following standards.
   1. Aluminum: AA SAS-30.
   2. Cold-Formed Structural Steel: AISI SG-673, Part I.
   3. Glass: Fully tempered glass in glass-supported handrails and railings require a design with a safety factor of three applied to the applicable modulus of rupture listed in "Mechanical Properties" in AAMA Aluminum Curtain Wall Series No. 12.

B. Structural Performance: Provide handrails and railings capable of withstanding the following structural loads without exceeding allowable design working stress of materials for handrails, railings, anchors, and connections:
   1. Top Rail: Shall withstand the following loads:
      a. Concentrated load of 200 lbf (890 N) applied at any point and in any direction.
      b. Uniform load of 50 lbf per foot (730 N/m) applied horizontally or vertically downward.
      c. Concentrated and uniform loads above need not be assumed to act concurrently.
   2. Handrails not Serving as Top Rails: Shall withstanding the following loads:
      a. Concentrated load of 200 lbf (890 N) applied at any point and in any direction.
      b. Uniform load of 50 lbf per foot (730 N/m) applied in any direction.
      c. Concentrated and uniform loads above need not be assumed to act concurrently.
   3. Guard Infill Area: Shall withstand the following loads:
      a. Concentrated horizontal load of 50 lbf (222 N) applied to 1 square foot (0.09 $m^2$) at any point in system, including panels, intermediate rails, balusters, or other elements composing infill area. Loads need not be assumed to act concurrently with loads on top rails in determining stress on guard.

C. Thermal Movements: Handrails and railings shall allow for movements resulting from 120-degree F (49 degree C) changes in ambient and 180 degree F (82 degree C) surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

D. Corrosion Resistance: Separate incompatible materials to prevent galvanic corrosion.

## 1.6 SUBMITTALS

A. General: Submit under provisions of Section 01 33 00 - Submittal Procedures.

B. Product Data:
1. Submit manufacturer's data sheets on each product to be used, including, but not limited to, the following:
   a. Preparation instructions and recommendations.
   b. Storage and handling requirements and recommendations.
   c. Installation methods.
2. Submit product data for manufacturers product lines of handrails and railings assembled from standard components, including, but not limited to, the following:
   a. Grout, anchoring cements, and paint products.

C. Shop Drawings: Submit shop drawings showing fabrication and installation of handrails and railings. Include plans, elevations, sections, details, and attachments to other work.

D. Samples:
1. Color Selection: Submit manufacturer's color charts showing the full range of colors available for products with factory-applied color finishes.
2. Finish Selection: Provide sections of railing or flat sheet metal which depict available mechanical surface finishes.
3. Verification Samples: For each type of exposed finish required, prepared on components indicated below and of same thickness and metal indicated for the work. If finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.
   a. 6 inch (152 mm) long sections of each different linear railing member, including handrails and top rails.

E. Quality Control Submittals:
1. Design Data: For installed handrails and railing systems indicated to comply with certain design loadings, include structural analysis data signed and sealed by the professional engineer who was responsible for their preparation.
2. Qualification Data: Submit documentation demonstrating capability and experience in performing installations of the same type and scope as specified by this Section. Include lists of completed projects with project names and addresses, names, and addresses of architects and owners, and other information specified.

## 1.7 QUALITY ASSURANCE

A. Qualifications:
   1. Manufacturer Qualifications: Manufacturer shall be a firm engaged in the manufacture of aluminum handrails and railings of types and sizes required, and whose products have been in satisfactory use in similar service for a minimum of 15 years.
   2. Installer Qualifications: Installer shall be a firm that shall have a minimum of five years of successful installation experience with projects utilizing aluminum handrails and railings similar in type and scope to that required forthis Project.
   3. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly.
   4. Coordination: Where concrete, masonry or other materials must be set to exact locations to receive work, furnish assistance and direction necessary to permit other trades to properly locate their work.
   5. Templates and Built-ins: Furnish all anchors, fastenings, sleeves, setting templates and layouts affecting or installed in the work of other trades.
   6. Replacement: Replace all damaged work at no cost to the owner.
   7. Perform work in accordance with ASTM E985.

B. Regulatory Requirements: Comply with applicable requirements of the laws, codes, ordinances, and regulations of Federal, State, and local authorities having jurisdiction. Obtain necessary approvals from such authorities.

C. Mock-Ups: Prior to installation of the work, fabricate and erect mock-ups for each type of finish and application required to verify selections made under sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mock-ups to comply with the following requirements, using materials indicated for final unit of work. Locate mock-ups on site in location and of size indicated or, if not indicated, as directed by the Architect. Demonstrate the proposed range of aesthetic effects and workmanship to be expected in the completed work. Obtain the Architect's acceptance of mock-ups before start of final unit of work. Retain and maintain mock-ups during construction in undisturbed condition as a standard for judging completed unit of work.When directed, demolish and remove mock-ups from the Project site.

   1. Accepted mock-ups in undisturbed condition at time of Substantial Completion may become part of completed unit of work.

D. Single Source Responsibility: Obtain aluminum handrails and railings from a single source with resources to produce products of consistent quality in appearance and physical properties without delaying the work.

## 1.8 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

## 1.9 PROJECT CONDITIONS

A. Environmental Requirements: Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

## 1.10 WARRANTY

A. General: See Section 01 77 00 - Closeout Procedures.

B. Warranty: Provide manufacturer's standard form outlining the terms and conditions of their Standard Limited Warranty:
   1. Surface Finish Warranty: One-year limited warranty.
   2. Material Integrity Warranty: One year limited warranty.

C. Additional Owner Rights: The warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to and run concurrent with other warranties made by the Contractor under requirements of the Contract Documents.

## 1.11 EXTRA MATERIALS

A. All supplemental materials not expressly specified in this section shall be approved by the Architect prior to installation.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

A. Basis of Design: Items specified are to establish a standard of quality for design, function, materials, and appearance. Equivalent products by other manufacturers are acceptable. The Architect will be the sole judge of the basis of what is equivalent.

## 2.2 MATERIALS

1. Regional Materials: Provide a minimum of [10 percent] [20 percent], based on cost, of building materials that are regionally extracted, processed, and manufactured.

B. Application/Scope of Work:

1. Architectural railing.
2. Structural glass railing.
3. Fencing and pool surround.
4. Vehicle and pedestrian gate.
5. Glass wall system.

C. Basis of Design: Hansen Architectural Systems, Inc.; 5500 SE Alexander Street, Hillsboro, OR 97123; Toll Free Tel: 800-599-2965, Fax: 503-356-8478; Email: info@aluminumrailing.com; Web: www.aluminumrailing.com.

D. Metals: Provide metal free from pitting, seam marks, roller marks, stains, discolorations, and other imperfections where exposed to view on finished units.
   1. Aluminum: Provide alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than strength and durability properties of alloy and temper designated below for each aluminum form required.
      a. Extruded Bar and Tube: ASTM B221/B221M, Alloy 6063-T5/T52.
      b. Extruded Structural Pipe and Tube: ASTM B429/B429M, Alloy 6063-T832.
      c. Drawn Seamless Tube: ASTM B210/B210M, Alloy 6063-T832.
      d. Plate and Sheet: ASTM B209/B209M, Alloy 6061-T6.
      e. Die and Hand Forgings: ASTM B247/B247M, Alloy 6061-T6.
      f. Castings: ASTM B26/B26M, Alloy A356-T6.
   2. Brackets, Flanges, and Anchors: Provide cast or formed metal of same type of material and finish as supported rails, unless otherwise indicated.
      a. Provide cast brackets with flange tapped for concealed anchorage to threaded hanger bolt.
      b. Provide formed or cast brackets with predrilled hole for exposed bolt anchorage.
      c. Provide formed steel brackets with predrilled hole for bolted anchorage and with snap-on cover that matches rail finish and conceals bracket base and bolt head.
      d. Provide brackets with interlocking pieces that conceal anchorage. Locate set screws on bottom of bracket.

E. Railing Components:
1. Extruded Aluminum Components: Provide manufacturer's standard extruded aluminum components as follows:
   a. Standard Post: 2.376 inches (60.35 mm) by 2.376 inches (60.35 mm) with radiused corner, 0.100 inch (2.54 mm) wall thickness.
   b. Bottom Rail: 1.6926 inches (42.99 mm) high by 1.676 inches (43.57 mm) wide with a 0.765 inch (19.43 mm) wide pocket on the top and an open bottom.
   c. Picket: 0.750 inches (19.05 mm) by 0.750 inches (19.05 mm), 0.062 inch (1.57 mm) wall thickness.
   d. Top Rail: Circular cross section, radius as indicated on the Drawings or, if not indicated, as selected by the Architect from the manufacturer's standards with an open bottom, 0.0866 inch (2.20 mm) wall thickness.
2. Condensation Insert: Provide rigid plastic post insert to evacuate entrapped water in hollow sections of railing members, 2-3/8 inches (60 mm) by 2-3/8 inches (60 mm) by 4-1/8 inches (105 mm) high.
   a. Basis of Design: "Dri-Post System," Hansen Architectural Systems, Inc.

F. Glass Products and Glazing Materials:
1. Glass: Provide fully tempered, uncoated, transparent flat glass meeting the requirements of ASTM C1048, Type FT, Condition A, Type 1, Quality q3. Products shall comply with properties indicated for class, thickness, and manufacturing process that have been tested for surface and edge compression according to ASTM C1048 and for impact strength according to 16 CFR Part 1201 for Category II materials.
   a. Clear Glass: Class 1 (clear).
   b. Thickness: 1/4 inch (6 mm) except where noted.
   c. Manufacturing Process: By vertical (tong-held) or horizontal (roller-hearth) process, at manufacturer's option. Horizontal process shall be performed tongless. Glass shall be free of tong marks and other visual distortions.
   d. Marking: Subject to compliance with requirements, provide glass permanently marked with certification label of Safety Glazing Certification Council or other agency acceptable to authorities having jurisdiction.
2. Glazing Cement and Accessories: Provide glazing cement and related accessories recommended or supplied by railing manufacturer for bonding glass to metal subrails.

G. Fasteners:
1. Handrail Anchors: Select fasteners of type, grade and class required to produce connections suitable for anchoring handrails and railings to other types of construction indicated and capable of withstanding design loads.
2. Handrail and Railing Component Anchors: Use fasteners fabricated from same basic metal, unless otherwise indicated. Do not use metals that are corrosive or incompatible with materials joined.
   a. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are standard fastening method for handrail and railing indicated.
   b. Provide Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.

3. Cast-in-Place and Post Installed Anchors: Provide anchors of type indicated below, fabricated from corrosion-resistant materials with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and equal to four items the load imposed when installed in concrete, as determined by testing per ASTM E488 conducted by a qualified independent testing agency.

    a. Cast-in-place anchors.
    b. Chemical anchors.
    c. Expansion anchors.

H. Grout and Anchoring Cement:
1. Non-Shrink, Non-Metallic Grout: Provide factory-packaged, non-staining, non-corrosive,
non-gaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
2. Interior Anchoring Cement: Provide factory-packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with water at project site to create pourable anchoring, patching and grouting compound. Use for interior applications only.

## 2.3 FABRICATION

A. Assemble handrails and railings in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.

B. Form changes in direction of railing members as shown on the Drawings.

C. Fabricate handrails and railings by connecting members with railing manufacturer's standard concealed mechanical fasteners and fittings, unless otherwise indicated. Fabricate members and fittings to produce flush, smooth, rigid, hairline joints.

D. Provide manufacturer's standard wall brackets, flanges, miscellaneous fittings, and anchors to connect handrail and railing members to other construction.

E. Tempered glass shall be cut to final size and shape before heat treatment; provide for proper edge clearance and bite on glass. Provide thickness indicated on the Drawings, not less than required to support structural loads.

F. Provide inserts and other anchorage devices to connect handrails and railings to concrete or masonry. Fabricate anchorage devices capable of withstanding loads imposed by handrails and railings. Coordinate anchorage devices with supporting structure.

G. Shear and punch metals cleanly and accurately. Remove burrs from exposed cut edges.

H. Cut, reinforce, drill, and tap components as indicated on the Drawings to receive

finish hardware, screws, and similar items.

I. Close exposed ends of railing members with prefabricated end fittings.

J. Provide mounted handrail wall returns at wall ends unless otherwise indicated. Close ends of returns, unless clearance between end of railing and wall is 1/4 inch (6 mm) or less.

## 2.4 FINISHES

A. General: Comply with NAAMM MFM for recommendations for applying and designating finishes.
   1. Appearance of Finished Work:
      a. Variations in appearance of abutting or adjacent units are acceptable if they are within one-half of the range of final samples. Noticeable variations in the same unit are not acceptable.
      b. Variations in appearance of other components are acceptable if they are within the range of final samples and are assembled or installed to minimize contrast.

B. Aluminum Finish: Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

   1. Powder Coat Finish: AA-C12-C42-R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: acid chromate-fluoride-phosphate conversion coating; Organic Coating: as specified below). Prepare, pretreat, and apply manufacturer's standard baked powder coat

      finish. Comply with coating manufacturer's written instructions for cleaning, surface preparation, pretreatment, and application.
      a. Material: Polyester powder coating, 3.0 mil (0.076 mm). Comply with AAMA 2604, including, but not limited to, average film thickness. Subject to compliance with requirements, provide one of the following products:
         1) “1PC-406 Series,” Forrest Paint Co.
         2) “Series 38,” TIGER Drylac U.S.A., Inc.
      b. Color: [_____].
      c. Gloss: [_____].
   2. Class I Clear Anodized Finish: AA-M12-C22-A41 (Mechanical Finish: as fabricated, non-specular; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear film thicker than 0.7 mil [0.018 mm]) complying with AAMA 611.
   3. Class I Color Anodized Finish: AA-M21-C22-A42/A44 (Mechanical Finish: as fabricated,
      non-specular; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, film thicker than 0.7 mil [0.018 mm] with integral color or electrolytically deposited color) complying with AAMA 611. Provide color to match the Architect’s sample, or, if no sample, as selected by the Architect from within full range of industry colors and color density range.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which the work is to be installed, and notify the Contractor in writing, with a copy to the Owner and the Architect, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.
   1. Examine substrates to receive anchors verifying that locations of concealed reinforcements have been clearly marked for the Installer. Locate reinforcements and mark locations if not already done.
   2. Beginning of the work shall indicate acceptance of the areas and conditions as satisfactory by the Installer.
   3.

### 3.2 PREPARATION

A. Coordinate setting drawings, diagrams, templates, instructions, and directions for installing anchors, such as sleeves, concrete inserts, anchor bolts, and miscellaneous items having integral anchors, that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to the Project site.

### 3.3 INSTALLATION

A. General:
   1. Fitting: Fit exposed connections together to form tight, hairline joints.
   2. Cutting and Placement: Set handrails and railings accurately in location, alignment, and elevation measured from established lines and levels and free from rack.
      a. Do not weld, cut, or abrade coated or finished surfaces of railing components that are intended for field connection by mechanical or other means without further cutting or fitting.
      b. Align rails so variations from level or parallel alignment do not exceed 1/4 inch in 12 feet (1.6 mm per m).
      c. Provide manufacturer’s proprietary system to evacuate entrapped water in hollow sections of railing members that are exposed to exterior or to moisture from condensation or other sources, in order to prevent water from entering the concrete slab. In lieu of the manufacturer’s proprietary system, if acceptable to the Architect, provide another means to evacuate the entrapped water, i.e., a weephole and epoxy fill system (“drill-and-fill”).
      d. Anchor posts in concrete with pipe sleeves preset and anchored into concrete. After posts have been inserted into sleeves, solidly fill annular space between post and sleeve with non-metallic, non-shrink grout, mixed and placed to comply with anchoring material manufacturer's directions.
      e. Anchor posts in concrete by forming or core drilling holes not less than 5 inches
      (127 mm) deep and 3/4 inch (19 mm) greater than outside diameter of post.

Clean holes of loose material, insert posts, and fill annular space between post and concrete with non-metallic, non-shrink grout, mixed and placed to comply with anchoring material manufacturer's directions

1) Cover anchorage joint with a round steel flange attached to post by set screws.
2) Leave anchorage joint exposed, wipe off surplus anchoring material, and leave 1/8 inch (3 mm) buildup, sloped away from post.

3. Corrosion Protection: Provide separation as recommended by manufacturer on concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals.
4. Adjusting: Adjust handrails and railings before anchoring to ensure alignment at abutting joint's space posts at interval indicated, but not less than required to achieve structural loads.
5. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing handrails and railings and for properly transferring loads to in-place construction.

B. Non-Welded Railings Connections: Use mechanical joints for permanently connecting railing components. Use wood blocks and padding to prevent damage to railing members and fittings.

C. Installing Glass Panels in Glass Handrails and Railings: Install assembly to comply with railing manufacturer's written instructions. Attach base channel to building structure, then insert and connect factory-fabricated and factory-assembled glass panels.
1. Erect glass handrails and railings under direct supervision of manufacturer's authorized technical personnel.

## 3.4 ADJUSTING AND CLEANING

A. Touch-Up Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and appoint exposed areas with same material.

B. Cleaning: Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in field to shop; make required alterations and refinish entire unit, or provide new units.

3.5 PROTECTION

A. Provide final protection and maintain conditions in a manner acceptable to the Installer, that shall ensure that the aluminum handrails and railings shall be without damage at time of Substantial Completion.

B. Protect finishes of handrails and railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at the time of Substantial Completion.

**END OF SECTION**

# SECTION 05 52 13

# PIPE AND TUBE RAILINGS

## PART 1 – GENERAL

### 1.1 SECTION INCLUDES

A. Wall mounted handrails.

B. Stair Mounted handrails and guardrails.

### 1.2 RELATED REQUIREMENTS

A. Section 03 30 00 – Cast-in-Place Concrete: Placement of anchors in concrete.
B. Section 04 20 00 – Unit Masonry: Placement of anchors in masonry.
C. Section 09 90 00 – Painting and Coating.

### 1.3 REFERENCE STANDARDS

A. ASTM A123/A123M – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2012.

B. ASTM A500/A500M – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2010a.

C. ASTM A501 – Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing; 2007.

D. ASTM E935 – Standard Test Methods for Performance of Permanent Metal Railing systems and Rails for Buildings; 2000 (Reapproved 2006).

E. ASTM E985 – Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2000 (Reapproved 2006).

F. SSPC-Paint 15 – Steel Joist Shop Paint; The Society for Protective Coatings; 1999 (Ed. 2004).

G. SSPC-Paint 20 – Zinc-Rich Primers (Type I, “Inorganic, “and Type II, “Organic”); The Society for Protective Coatings; 2002 (Ed. 2004).

### 1.4 SUBMITTALS

A. See Section 01 33 00 for submittal procedures.
B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.

1. Provide design engineer's stamp on shop drawings.

### 1.5 QUALITY ASSURANCE

A. Design to be performed under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in Florida.

B. Fabricator Qualifications: A qualified steel fabricator that is accredited by the International Accreditation Service (IAS) Fabricator Inspection Program for Structural Steel (AC172).

## PART 2 - PRODUCTS

### 2.1 RAILINGS – GENERAL REQUIREMENTS

A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of ASTM E985 and applicable local code.

B. Allow for expansion and contraction of members and building movement without damage to connections or members.

C. Dimensions: See drawings for configuration and heights.
   1. Top Rails and Wall Rails: 1-1/2 inches (38 mm) diameter, round.
   2. Intermediate Rails: 1-1/2 inches (38 mm) diameter, round.
   3. Posts: As indicated on drawings.

D. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.
   1. For anchorage to concrete, provide inserts to be cast into concrete, for bolting anchors.
   2. For anchorage to masonry, provide brackets to be embedded in masonry, for bolting anchors.
   3. For anchorage to stud walls, provide backing plates, for bolting anchors.
   4. Posts: Provide adjustable flanged brackets.

### 2.2 STEEL RAILING SYSTEMS

A. Steel Tube: Stainless steel in exterior applications, where occurs. Shop primed at all interior locations structural tubing.
B. Steel Pipe: ASTM A53/A53M, Grade B Schedule 40, black finish.
C. Non-Weld Mechanical Fittings: Slip-on, galvanized malleable iron castings, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.
D. Welding Fittings: Factory-or shop-welded from matching pipe or tube, seams continuously welded: joints and seams ground smooth.

E. Exposed Fasteners: Flush countersunk screws or bolts; consistent with design of railing.
F. Straight Splice Connectors: Steel concealed spigots.
G. Galvanizing: In accordance with requirements of ASTM A123/ASTM A123M.
    1. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I – Inorganic.
H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.

### 2.3 FABRICATION

A. Accurately form components to suit specific project conditions and for proper connection to building structure.
B. Fit and shop assemble components in largest practical sizes for delivery to site.
C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
D. Welded Joints:
    1. Exterior Components: Continuously seal joined pieces by continuous welds. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
    2. Interior Components: Continuously seal joined pieces by continuous welds.
    3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive work.

### 3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.

B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.

### 3.3 INSTALLATION

A. Install in accordance with manufacturer’s instructions.

B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.

C. Anchor railings securely to structure.

D. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

## 3.4 TOLERANCES

A. Maximum Variation from Plumb: ¼ inch (6 mm) per floor level, non-cumulative.

B. Maximum Offset from Tue Alignment: ¼ inch (6 mm).

C. Maximum Out-of-Position: ¼ inch (6 mm).

**END OF SECTION**

# SECTION 05700

# DECORATIVE METAL

## PART 1 – GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the contract, including General Conditions, apply to work of this section.

B. Extend of work as specified and as shown contract drawings.

### 1.2 SCOPE

A. Perforated aluminum panels as shown on contract drawings. It is acknowledged that this is a performance specification. The materials herein specified have been carefully chosen due to their inherent performance characteristics. Lesser quality material will not be considered or approved. A manufacturer is named to establish a reference for quality and appearance.

### 1.3 RELATED WORK SPECIFIED ELSEWHERE

A. Structural Framing or Miscellaneous Metal.

B. Support Elements for Other Trades.

### 1.4 QUALITY ASSURANCE

A. Manufacturer: Firm with manufacturing and delivery capacity required for project shall have successfully completed at least five (5) projects within the past five (5) years of similar size and utilizing similar systems.

### 1.5 SUBMITTALS

A. Product Data: Submit manufacturer's standard product specifications, details, drawings independent test data and installation instructions for each component required.
Test data shall include copies of the original system tests, and independent component tests where applicable. Tests shall be conducted for the complete systems of the manufacturer.

B. Submission: Must be within 60 days of the general contract award to avoid project delay. It is acknowledged that the specified systems are long lead-time items. And coordination with other trades it critical. If this schedule is not adhered to, architect will designate product to be utilized, and contractor will have no recourse.

C. Samples: Submit three each (3) of each system component; Flat components 6" x 6",

linear components 6” length. All sample to be from a standard production run.

D. Shop Drawings: Sub Contractor for the work of this section shall submit complete shop drawings. Shop drawings shall show all components in exploded isometric detail, complete elevations, and all pertinent sections. All novel details shall be clearly shown.

### 1.6 SEQUENCING

A. Substitute Products: Alternate proposals for substitute products will not be accepted unless approved as issued in addenda. Substitute products will not be issued in addenda unless request for substitution and complete and sufficient data are furnished to the architect and owner for review.

B. Contract Execution: Submittals, including mock-up, shall be completed and approved prior to the award of the subcontract for this section.

C. Manufacturer’s Production Schedule: Subcontract for the work of this section shall be awarded to allow sufficient time for manufacturer’s standard production schedule. Subcontractor shall submit a written confirmation of production and delivery schedule on Manufacturer’s Letterhead within sixty (60) days of general contract award. Delays in awarding a material contract, which threaten the completion schedule and consequential cost is the responsibility of the subcontractor.

### 1.7 WARRANTY

A. General Submit Manufacturer’s Warranty that the materials furnished will perform as specified, and have been installed in more than 5 similar projects in the past five (5) years.

## PART 2 - PRODUCTS

### 2.1 PRODUCT CONSTRUCTION:

The basis for design for this is by www.mcnichols.com and www.gratingpacific.com or equal. Other manufacturers must be approved prior to the bid in written form, by the architect. Specified manufacturer’s standard of quality and manufacturing tolerances shall be criteria for evaluating “equivalent” product.

A. Panel Type 1: 1/8 thick perforated aluminum shall be /16” dia. Round holes, ¼” centers, offset pattern, 51% open area.

B. Panel type 2: 3/8” thick perforated aluminum with 1” dia. Round holes, 12/8” centers, offset pattern, 48% open area.

C. All hardware shall be per manufacturer as part of the finished system with specifications derived from the manufacturer’s engineering calculations.

D. Panel dimensions are Architectural Drawings with no exceptions.

E. Attachment hardware design and location as shown on contract drawings and confirmed per manufacturer’s engineering calculations and shop drawings.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine building structure scheduled to receive components of this section for moisture, temperature, unevenness or irregularities that would affect the quality and execution of the work. If adverse conditions are found, notify General Contractor in writing, and DO NOT proceed until corrected.

B. Tolerances (all systems included in this section) to be installed with a maximum permissible deflection of L/360 of span and maximum surface deviation of 1/8” in 10’-0” (no loads applied).

### 3.2 INSTALLATION

A. General: Comply with manufacturer’s Printed Instructions and all details and directions shown on contract drawings.

### 3.3 CLEANING AND PROTECTION

A. Protection of all components contained in this section protected by General Contractor after installation.

B. Clean all surfaces following installation with a mild, biodegradable soap solution and rinse.

C. Replace or repair units having scratches, abrasions, or other defects upon completion of installation of each unit.

### 3.4 GENERAL RESPONSIBILITIES

A. Variation from Specification: Any variation from any section of this specification, resulting in additional costs to any other contractor, sub-contractor or supplier, on this project, shall be the sole financial responsibility of the contractor for the work of this section.

B. All conditions as indicated in sections included in 05000 series will be considered a part of this section where applicable.

**END OF SECTION**

# SECTION 07 14 00

# FLUID-APPLIED MEMBRANE WATERPROOFING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Provide a cold fluid-applied bitumen-modified polyurethane waterproofing system on structural concrete, metal or other substrates.

1. Work includes substrate preparation.
2. Work includes bridging and sealing air leakage and water intrusion pathways and gaps including connections of the walls to the roof air barrier, and penetrations of the building envelope including piping, conduit, ducts and similar items.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 03 30 00 – CAST-IN-PLACE CONCRETE.
2. Section 07 92 00 – JOINT SEALANTS.

### 1.3 PERFORMANCE REQUIREMENTS

A. Cold fluid applied bitumen-modified polyurethane waterproofing system is intended to perform as a continuous barrier against liquid water and to flash or discharge to the exterior incidental water. Membrane system is not long-term UV resistant and is intended to receive an overburden of concrete, tile in a cementitious setting bed, pavers in a sand setting bed, pavers on supporting pedestals, or soil/growing media, and shall accommodate movements of building materials as required with accessory sealant materials at locations such as: changes in substrate, perimeter conditions and penetrations. Installed waterproofing membrane system shall not permit the passage of water, and will withstand the design pressures calculated in accordance with the most current revision of ASCE 7.

B. Manufacturer shall provide all primary waterproofing materials that are physically and chemically compatible when installed in accordance with manufacturers current application requirements.

### 1.4 SUBMITTALS

A. Submittals: Comply with project requirements for submittals as specified in Division 01.

B. Product Data: For each product.

C. Shop Drawings: Manufacturer’s standard details and shop drawings for the specified system.

D. Installer's Authorization: Installer shall provide written documentation from the manufacturer of their authorization to install the 10 and 20 year system, and eligibility to obtain the warranty specified in this section.

1. Applicator shall be currently approved by the waterproofing manufacturer and shall have at least 5-years' experience in installing materials of types specified and shall have successfully completed at least six projects of similar scope and complexity.
2. Applicator shall designate a single individual as Project foreman who shall be on site at all times during installation.

E. Manufacturer' Certification: Certification showing full time quality control of production facilities and that each batch of material is tested to ensure conformance with the manufacturer's published physical properties.

F. VOC Certification: Manufacturer's certification that all waterproofing system products meet current Volatile Organic Compound (VOC) regulations as established by the State in which they are being installed; and stating total VOC content, in grams per liter, for all system components (i.e. primers, adhesives, coatings, etc.).

## 1.5 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Manufacturer shall demonstrate qualifications to supply materials of this section by certifying the following:

1. Membrane Manufacturer shall have available an in-house technical staff to assist the contractor when necessary in the application of the products and site review of the assembly.

B. Installer's Qualifications: The Contractor shall demonstrate qualifications to perform the Work of this Section by submitting certification or license by the waterproofing membrane manufacturer as a trained and authorized applicator of the product the installer intends to use.

C. Source Limitations: All components listed in this section shall be provided by a single manufacturer or approved by the primary waterproofing manufacturer.

D. Materials Compatibility: All materials included in the waterproofing assembly, as well as associated materials adhered to/applied beneath the waterproofing membrane shall have been tested and verified to be compatible. Include written testing documentation and test reports as requested by Architect.

E. Applicable Regulations: Comply with local code and requirements of authorities having jurisdiction. Do not exceed VOC regulations as established by the State in which they are being installed; including total VOC content, in grams per liter, for all system components (i.e. primers, adhesives, coatings, and similar items).

F. Waterproofing Terminology: Refer to ASTM D1079 and the glossary of the National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual for definitions of waterproofing terms related to this section.

## 1.6 PRE-INSTALLATION CONFERENCE

A. Prior to scheduled commencement of the waterproofing installation and associated work, conduct a meeting at the project site with the installer, architect/consultant, owner, manufacturer's representative and any other persons directly involved with the performance of the Work. The

Installer shall record conference discussions and to include decisions and agreements reached (or disagreements), and furnish copies of recorded discussions to each attending party. The main purpose of this meeting is to review foreseeable methods and procedures related to the Work, to establish procedures to maintain optimum working conditions, and to coordinate this work with related and adjacent work..

## 1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver all waterproofing materials to the site in original containers, with factory seals intact.

B. Store all pail goods in their original undamaged containers in a clean, dry location within their specified temperature range.

C. Do not expose materials to moisture in any form before, during, or after delivery to the site. Reject delivery of materials that show evidence of contact with moisture.

D. Remove manufacturer supplied plastic covers from materials provided with such. Use “breathable” type covers such as canvas tarpaulins to allow venting and protection from weather and moisture. Cover and protect materials at the end of each work day. Do not remove any protective tarpaulins until immediately before the material will be installed.

E. Materials shall be stored above 60-95°F (15-35°C) a minimum of 24 hours prior to application

## 1.8 PROJECT CONDITIONS

A. Weather: Proceed with waterproofing only when existing and forecasted weather conditions permit. Membrane application should not proceed when precipitation is imminent. Ambient temperatures shall be above 36°F (2°C) when applying the waterproofing system, or within the required parameters as set by the manufacturer’s printed literature.

B. All surfaces to receive the waterproofing membrane shall be free from visible water, dew, frost, snow and ice. Surfaces shall be broom clean, dry, sound and free of voids, holes, rock pockets, honeycombs, protrusions, excessive roughness, foreign matter, and other contaminants which may inhibit application or performance of the waterproofing membrane system. Application of waterproofing membrane shall be conducted in well ventilated areas.

C. Application on Green Concrete:
Horizontal: 48 hours or walkable conditions
Vertical: 24 hours after forms removed

D. Waterproofing Membrane:

1. Waterproofing membrane is not intended to be exposed or in contact with a constant temperature below -25°F (-31.7°C) or in excess of 200°F (93.3°C). See technical data sheets for limitations, i.e., hot pipes and vents or direct steam venting.
2. Specified waterproofing membrane is VOC compliant. Consult container, packaging labels and Safety Data Sheets (SDS) for specific safety information.
3. Some low molecular weight alcohols can soften. Any exposure to foreign materials or chemical discharges shall be presented to membrane manufacturer for evaluation to determine any impact on the waterproof membrane assembly performance prior to warranty issuance.

E. Contractor shall ensure adequate protection during installation of the waterproofing system.

### 1.9 WARRANTY

A. Warranty: Provide manufacturer's standard warranty. Materials warranty shall be for a minimum of one year starting at the date of Substantial Completion. System warranty shall be for the following duration in accordance with specified system. Most warranties require the use of a protection board and drainage mat. Check www.usa.sika.com for the latest "Sikalastic 320 System Guidelines" for more information.

1. Warranty Length: 5 years 60 mil system.
2. Warranty Length: 10 years 90 mil system with approved project.
3. Warranty Length: 20 years 120 mil system with and without reinforcing and approved applicator.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURER

A. Basis-of-Design Manufacturer: Sika Corporation, 201 Polito Avenue, Lyndhurst NJ 07071. No substitutions without prior written approval by the Architect.

B. Provide a complete fluid applied elastomeric waterproofing membrane system designed for concealed building components subject to hydrostatic head that is polyurethane, coal-tar free and complies with ASTM C836.

### 2.2 WATERPROOFING SYSTEM

A. Fluid-Applied Membrane System, 5 Year System: Sikalastic 320:

a. Sikalastic 320, 60 mils wet film thickness resulting in 25 SF/gal coverage

B. Fluid-Applied Membrane System, 10 Year System: Sikalastic 320, Sika Flexitape Heavy:

a. Sikalastic 320, 90 mils wet film thickness resulting in 18 SF/gal coverage

b. Reinforcing fabric required for moving transitions such as transitions between dissimilar materials, penetrations, plywood seams, joints and cracks.

C. Fluid-Applied Membrane System, 20 Year System: Sikalastic 320, Sika Fleece-120, Sikalastic PF Lo-VOC Primer:

a. 1. Horizontal surfaces receive Sikalastic 320 SL at 120 mils wet film thickness resulting in 13 SF/gal coverage in the following fashion: Sika approved reinforcement is immediately embedded into a 60 mil base coat with a roller until saturated in Sikalastic 320 SL then an additional 60 mil top coat is applied according to the data sheet;

Or,

2. Horizontal surfaces receive Sikalastic PF Lo-VOC Primer applied according to the datasheet and allowed to dry. Then Sikalastic 320 SL is applied at 120 mils wet film thickness resulting in 13 SF/gal coverage.

b. Vertical surfaces receive Sikalastic 320 NS at 90 mils wet film thickness resulting in 18 SF/gal coverage. Reinforcing fabric required for moving transitions such as between dissimilar materials, penetrations, plywood seams, joints and cracks.

## 2.3 MEMBRANES AND COATINGS

A. Base embedment coat with Sika Fleece reinforcement per the waterproofing system build shall be Sikalastic 320 NS, SG or SL by Sika Corp, a single component, cold fluid applied, moisture cure, bitumen modified, polyurethane base coat membrane.

B. Top coat with Sika Fleece reinforcement per the waterproofing system build shall be Sikalastic 320 NS, SG or SL by Sika Corp, a single component, cold fluid applied, moisture cure, bitumen modified, polyurethane base coat membrane.

C. Base coat and top coat membranes shall be low in VOC's, and be a one component elastomeric polyurethane membrane that may be brush or roller applied. Membrane shall have the following physical properties and conforms to ASTM D7311-07: Standard Specification for a single component, cold fluid applied, moisture cure, bitumen modified, polyurethane membranes.

D. Liquid and Cured Film Property Requirements:

| Standard Measurement / Grade | SL | NS | SG |
|---|---|---|---|
| ASTM D-624, Die C: Tear Resistance (psi) | 55 ± 15 | 90 ± 15 | 90 ± 15 |
| ASTM D-412: Elongation at Break (%) | 550 ± 50 | 600 ± 25 | 600 ± 25 |
| ASTM D-412: Tensile Strength (pli) | 330 ± 20 | 350 ± 15 | 350 ± 15 |
| ASTM D-2240: Hardness (Shore A) | 30 ± 5 | 30 ± 5 | 30 ± 5 |
| ASTM D-2697: Total Volume Solids (%) | 95 ± 2 | 95 ± 2 | 86 ± 2 |
| ASTM D-236: Total Weight Solids (%) | 99 ± 2 | 96 ± 2 | 88 ± 2 |
| ASTM D-2369-81: VOCs (g/l) | 45 | 46 | 89 |
| ASTM E96-15: Water Vapor Transmission (perms) | 1 ± 0.2 | 1 ± 0.2 | 1 ± 0.2 |
| Viscosity (Poise @ 80°F) | 30 ± 10 | 350 ± 100 | 150 ± 50 |
| Specific Gravity | 1.19 | 1.19 | 1.19 |

## 2.4 MEMBRANE REINFORCEMENT - POLYESTER

A. Reinforcement for the waterproofing membrane system shall be Sika Fleece by Sika Corp., a non-woven, needle-punched polyester fleece specifically designed to provide greater impact resistance and greater resistance to excessive thermal and structural movement while maintaining elasticity and membrane film integrity.

B. Supplemental reinforcement of the waterproofing membrane system shall be Sika Flexitape Heavy by Sika Corp., a nylon mesh specifically designed for local reinforcement of the waterproofing membrane at structural cracks, expansion joints and transitions between dissimilar materials.

## 2.5 FILLET BEAD AND PENETRATION SEALANT

A. Sealant for fillet bead applications and membrane penetrations shall be any Sikaflex sealant including Sikaflex 1a, 1a+, 2c NS EZ Mix, or 11FC by Sika Corp., one and two part polyurethane sealants suitable for fillet bead transition compound to be applied prior to the installation of the membrane system at changes in substrate direction, sealing reglet terminations, cracks in the substrate and penetrations of the waterproofing system.

## 2.6 PRIMERS

A. Use of a primer is required for all membrane installations. See “Sikalastic 320 System Guidelines” for more information. Use: Sikalastic FTP Lo-VOC Primer for green or damp concrete (as required by warranty); Sikaflex Primer 449 for PVC; Sikalastic Recoat Primer for Fiberglass or before recoating on old Sikalastic 320; and Sikalastic PF Lo-VOC Primer for all other surfaces including concrete, EIFS, DensGlass, metal, and marine grade or high density plywood.

## 2.7 REPAIR AND PATCHING

A. Cementitious repair mortar to repair bug holes, spalled areas, and other non-structural surface defects, to fill uneven areas and birdbaths, or to repitch decks shall be SikaQuick 1000 by Sika Corp., a two component, polymer-modified, Portland cement, fast-setting, trowel-grade mortar.

## 2.8 DRAINAGE MAT

A. Dimpled core polystyrene drainage mat with a non-woven (420) and woven (720) polypropylene filter fabric bonded to the topside of the mat, and a bonded protection sheet on the underside of the mat. To be installed between the waterproofing membrane and extruded polystyrene insulation. Drainage mat to be Sika Drainage Mat 420 or 720.

B. Geonet polypropylene composite drainage mat with a non-woven polypropylene filter fabric bonded to the topside of the mat, and a bonded protection sheet on the underside of the mat. To be installed between the waterproofing membrane and extruded polystyrene insulation. Drainage mat to be Sika Drainage Mat 1000.

C. Impermeable dimpled polystyrene drainage perforated core with a bonded to a root resistant non-woven polypropylene filter fabric on the top side and non-woven polypropylene membrane protection fabric on the bottom side. The core is installed dimpled side down to allow water retention within the cups. Excess water is collected and conveyed to a proper collection system, helping to control drainage flow. To be installed between the waterproofing membrane and extruded polystyrene insulation. Drainage mat to be Sika Drainage Mat GRS.

## 2.9 EXTRUDED POLYSTYRENE INSULATION

A. Extruded polystyrene foam board insulation, either flat stock or tapered, meeting the requirements of ASTM 578 Type VI (40 psi – stone ballast or pavers in sand bed/direct application), Type VII (60 psi – concrete pavers on pedestals), or Type V (100 psi – superimposed loads). Insulation shall be Sarnatherm XPS by Sika Corp.

## 2.10 FILTER FABRIC

A. Non-woven needle-punched polyester UV-stabilized mat, 3 oz./sq.yd., used between the extruded polystyrene insulation and overburden. Filter fabric shall be Sika 120 Fleece by Sika Corp.

## 2.11 SPRAY EQUIPMENT

A. Use Sikalastic® 320 SG

B. Graco GH 833 Big Rig or Titan Hydra Pro IV airless pump.

For Graco GH 833 Bare:
- (PN 287915) - 1.5" Solvent-Resistant Siphon Kit
- (PN 277253) - 1/2" Graco High Pressure Hose (4000 psi)

- (PN 277249) - 1/4" x 3' Graco High Pressure Whip (4000 psi)
- (PN LTX535) - Graco 535 Spray Tip
- (PN 287020) - Graco 15" Tip Extension Wand
- (PN 246468) - Graco Flex Plus Gun

For Titan Hydra Pro IV with 1" pick up hose:
- (PN 500450050) - 50' ½" airless hose
- (PN 500450010) - 100' ½"airless hose
- (PN 316-533) - 6 foot ¼" whip hose
- (PN 0550070) - S-5 airless spray gun
- (PN 662-535) - Airless spray tip
- (PN 310-390) - 3' extension with swivel
- (PN 814-003) - 1/4" to 1/2" hose fitting
- (PN 815-005) - 3/8" to 1/2" manifold to hose fitting

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the Work of this section. Notify Architect in writing of any discrepancies. Commencement of the Work in an area shall mean Installer's acceptance of the substrate.

B. Surfaces shall be sound, clean and free of standing water, oil, grease, dirt, excess mortar or other contaminants. Fill voids, gaps and spalled areas in substrate to provide an even plane. Strike masonry joints full flush.

C. Examine edges, framing, flashings, openings, substrates and junctures at other construction for suitable conditions where the system will be installed. Ensure that Work done by other trades is complete and ready for the systems to be installed. Verify compatibility with and suitability of flashings, materials and substrates.

### 3.2 SURFACE PREPARATION

A. Verify that the deck is clean and smooth, free of depressions, waves, or projections, and properly sloped to drains, valleys, eaves, scuppers or gutters. Verify that all openings or penetrations through the intended substrate are secured back to solid blocking. Ensure all preparatory Work is complete prior to applying membrane.

B. Mechanical fasteners used to secure sheathing boards or penetrate sheathing boards shall be set flush with sheathing and fastened into solid backing.

C. All surfaces shall be blown clean using an air compressor to remove any remaining loose debris.

D. All cracks and voids greater than 1/16 inch shall be routed and caulked with a Sikaflex sealant. Allow to cure per waterproofing membrane manufacturer's technical data sheets prior to over-coating with the specified waterproofing membrane system. Green concrete cracks or joints can be sealed with Sikaflex 1a+.

E. At all inside corners, gaps or voids at the juncture of the deck and penetrations apply a minimum 3/4 inch fillet bead of Sikaflex sealant and allow to cure per waterproofing membrane manufacturer's technical data sheets prior to installing the waterproofing membrane system.

F. Sikaflex Sealants used in detailing can be over coated with Sikalastic 320 once tack free.

G. Membrane is self-terminating but membrane terminations can be established prior to project start-up and documented in shop drawings. Terminations can occur in raked-out mortar joints, saw cut terminations or under installed counter-flashing materials.

H. Use tape lines to achieve a straight edge detail.

### 3.3 SUBSTRATE PREPARATION

A. Acceptable substrates include concrete, concrete block, solid wood/plywood sheathing, and metal.

B. Structural Concrete:

1. Acceptable concrete substrates are limited to poured in place concrete decks.
2. Minimum deck thickness for structural concrete is 4 inches (10.2 cm).
3. Concrete surface to be light broom finish or equivalent as required by manufacturer.
4. Curing agents shall be checked for compatibility with specified waterproofing materials. Most curing agents shall be completely removed from the substrate by grinding, scarifying, or other mechanical means.
5. Concrete and masonry surfaces shall be low-pressure (5,000 psi or less) power-washed in accordance with ICRI Guideline No. 03732: Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays to remove all dirt, debris or surface contamination that would compromise bonding of the specified waterproofing membrane system. Remove oil or grease with solvents, or detergent and water. Rinse surface clean of remaining cleaning agents.

C. Metal Decking:

1. Metal profile decks shall be sound and secured to purlins, bar joists, etc. A ½" thick thermal barrier shall be installed and secured over all metal profile decks in accordance with wind uplift requirements.

D. Metal Surfaces:

1. Exposed drain bowls, pipes, and other metal surfaces shall be cleaned by power tool cleaning (SSPC SP-3) to remove corrosion deposits back to a clean, bright metal followed by a solvent wipe prior to application of the specified primer.

### 3.4 PRIMING

A. Metal

**1.** Apply Sikalastic PF Lo-VOC primer for metal surfaces. To clean and prepared drain bowls and other metal surfaces by brush or roller at the application rate shown on the technical data sheet to achieve an overall wet film thickness of 8 mils. **High porosity and roughness of the substrate will decrease coverage rates.**
2. Allow to cure and dry in accordance with manufacturer's technical data sheets.

B. PVC

1. Apply Sikaflex 449 Primer to clean and prepared PVC surfaces by brush or roller at the application rate of 100-150 SF/gal. **High porosity and roughness of the substrate will decrease coverage rates.**

2. Allow to cure and dry in accordance with manufacturer's technical data sheets.

## 3.5 MEMBRANE REINFORCEMENT

A. Reinforcement of Cracks, Plywood and Cover Board Joints/Seams, and Base/Curb Flashing Transitions:

1. For all locations where the specified membrane system is to be applied directly to the substrate surface, reinforcement of cracks and joints prior to applying the specified membrane system is conditional on the terms agreed to in a given warranty
2. For all horizontal-to-vertical transitions, provide a ¾" x ¾" Sikaflex polyurethane sealant cant.
3. Back roll reinforcement to fully embed reinforcement into the wet liquid polyurethane membrane. Add more liquid membrane as needed to fully embed the reinforcement.
4. Ensure reinforcement is not in tension during embedment.

## 3.6 COLD FLUID APPLIED MEMBRANE APPLICATION

A. Install waterproofing membrane system in accordance with current technical data sheets and in accordance with warranty guideline requirements. Waterproofing system should meet or exceed the requirements of ASTM C898/C898M and ASTM C1471/C1471M.

B. Apply base embedment coat to horizontal deck and vertical wall surfaces by brush or with 1/2 inch – 3/4 inch nap roller to achieve a continuous and uniform minimum wet film thicknesses as specified in warranty guideline requirements.

C. Immediately lay specified conformable reinforcement into the wet base embedment resin coat.

D. Apply pressure to the membrane reinforcement with a roller as appropriate to fully embed and saturate the membrane reinforcement into liquid waterproofing material. Remove air pockets from under the membrane by rolling them out.

E. Apply additional liquid material as required to ensure desired millage and the membrane reinforcement is fully embedded and has conformed to the substrate without tenting or visible pinholes.

F. Overlap sheets of Fleece membrane reinforcement 3 inches at side laps and 6 inches at end laps.

G. Extend membrane reinforcement vertically at adjacent wall surfaces in accordance with project details and specifications.

H. When using polyester fleece reinforcement, immediately apply the resin top coat wet-on-wet when Sikalastic 320 is mixed with water. If Sikalastic 320 is not mixed with water, apply reinforced system in two separate coats with 16-24 hours in between coats. DO NOT mix Sikalastic 320 SG with water when using an airless sprayer and/or pump. This could cause material to cure inside the pump.

I. Apply top coat by nap roller or brush to achieve a continuous and uniform minimum wet film thickness as specified in warranty guideline requirements.

J. Install all flashings in accordance with manufacturer's construction details.

## 3.7 PARAPET AND WALL FLASHINGS

A. Clean, prepare and prime if necessary substrate surfaces ready to receive membrane.

B. All parapet, wall, and curb flashings shall be provided with a Sikaflex sealant cant bead membrane application.

C. Terminate waterproofing membrane system at raked-out mortar joints, termination saw cut joint, or under installed counter-flashing materials. Seal all mortar joints and saw cut joints with Sikaflex polyurethane sealant.

D. Install metal counter flashings in accordance with details.

### 3.8 DRIP EDGES AND OTHER METAL FLANGED FLASHING

A. Scuff, clean, prepare and prime metal flange surfaces ready to receive membrane.

B. Metal flanges are typically encapsulated between two membrane layers, usually by providing membrane flashing as a stripping ply over the metal flange, with the field or flashing membrane extending beneath the metal flange. It is also acceptable to install the stripping ply under the metal flange, and extend the field or flashing membrane over the metal flange.

### 3.9 DRAINS

A. Clean, prepare and prime surfaces ready to receive membrane applications. Block drain bowl opening to avoid waterproofing material from entering the drainage system.

B. Remove strainer baskets and clamping rings from the drain bowl assembly. Temporarily replace the bolts back into assembly to avoid miss-alignment of connections after membrane applications are completed.

C. Extend the liquid waterproofing material and membrane reinforcement directly into the throat of the prepared drain.

D. Remove drain blocks and allow the waterproofing system to fully cure dry prior to re-connecting the drain bowl assembly.

### 3.10 PENETRATIONS

A. Clean, prepare and prime surfaces ready to receive membrane. Ensure that penetrations are secured to prevent movement.

B. Apply a cant bead of Sikaflex sealant the base of penetrations and apply Sikalastic 320 membrane vertically up the penetration 6-8 inches.

### 3.11 EXPANSION JOINTS

A. Expansion joints are formed separately from the Sikalastic 320 membrane.

### 3.12 APPLICATION OF PENETRATION SEALANT

A. Seal reglet-based membrane terminations, heads of exposed mechanical fasteners, around penetrations, duct work, electrical and other apparatus extending through the waterproofing membrane with specified penetration sealant.

## 3.13 FLOOD TEST

A. Upon the completion of the waterproofing membrane system and associated terminations the contractor shall flood test the system. Provide temporary stops and plugs for the drains within the test area. Flood test with a minimum 2 inches of water for no less than 24 hours.

B. Repair and retest the system for no less than 24 hours, report all deficiencies to the Architect. Remove temporary stops and plugs. No other Work is to proceed without prior direction from the Architect.

## 3.14 PROTECTION

A. Protect waterproofing Work from other trades until completion.

B. Stage materials in such a manner that avoids foot traffic over completed waterproofed areas.

C. Provide temporary walkways and platforms to protect completed Work from traffic and point loading during the application process.

D. Provide temporary membrane tie-ins and water-stops at the end of each workday and remove prior to commencement of work the following day.

## 3.15 PREFABRICATED COMPOSITE DRAINAGE AND PROTECTION MAT

A. Install the drainage mat when it can be followed immediately by the installation of the extruded polystyrene insulation and overburden. If the drainage mat cannot be installed within one week of membrane application, a protection course must be applied over the membrane to protect from other trade work and UV radiation.

B. Install the drainage mat on horizontal and vertical surfaces in accordance with the product data sheet. Lay out and position drainage mat, and allow to lay flat. Cut and closely fit drainage mat to perimeter and penetrations.

C. Overlap filter fabric from adjacent sheets/rolls, and bond all fabric overlaps with Sikaflex sealant. Install supplemental filter fabric as required to ensure filter fabric continuity at flashing locations.

## 3.16 INSTALLATION OF EXTRUDED POLYSTYRENE INSULATION

A. Before the application of the insulation, any damage or deterioration to the composite drainage and protection mat shall be repaired.

B. Loose lay insulation in a staggered manner, and tightly butt together all insulation boards. The maximum acceptable joint width is 3/8 inch. Cut and closely fit insulation within ¾ inches to perimeter and penetrations.

C. For multi-layer insulation applications, the bottom layer shall be the thickest layer and shall be a minimum of 2 inches thick. Stagger the joints of each insulation layer.

D. Vertical insulation applications can be spot-adhered to the drainage mat and to additional insulation layers, utilizing an acceptable adhesive.

E. Do not install damaged insulation boards.

### 3.17 FILTER FABRIC

A. Install filter fabric on horizontal and vertical surfaces over the extruded polystyrene insulation in accordance with the product data sheet.

B. Lay out and position filter fabric. Cut and closely fit filter fabric to perimeter and penetrations, extending the filter fabric vertically to the height of the overburden.

C. Overlap filter fabric to achieve 6 inch side and end laps. As required, bond all fabric overlaps with Sikaflex sealant to ensure filter fabric continuity prior to and during overburden installation.

### 3.18 TRAFFIC-BEARING OVERBURDEN

A. Install traffic-bearing overburden, in accordance with specifications and as per Division 32.

### 3.19 CLEAN-UP

A. Work areas are to be kept clean, clear and free of debris at all times.

B. Do not allow trash, waste, and/or debris to collect on the work area. Trash, waste, and/or debris shall be removed from the work area on a daily basis.

C. All tools and unused materials shall be collected at the end of each workday and stored properly off of the finished waterproofed surface and protected from exposure to the elements.

D. Dispose of or recycle all trash and excess material in a manner conforming to current EPA regulations and local laws.

E. Properly clean the finished deck surface after completion, and make sure the drains and gutters are not clogged.

F. Clean and restore all damaged surfaces to their original condition

**END OF SECTION**

# SECTION 07 55 56

# FLUID-APPLIED PROTECTED MEMBRANE ROOFING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Provide a protected cold-fluid-applied polyurethane roofing/waterproofing system on structural concrete, plywood sheathing, cover board, metal or other substrates.

1. Work includes substrate preparation.
2. Work includes bridging and sealing air leakage and water intrusion pathways and gaps including connections of the walls to the roof air barrier, and penetrations of the building envelope including piping, conduit, ducts and similar items.

B. Related Work: The following items are not included in this Section and are specified under the designated Sections:

1. Section 03 30 00 – CAST-IN-PLACE CONCRETE.
2. Section 07 60 00 – FLASHING AND SHEET METAL.
3. Section 07 92 00 – JOINT SEALANTS

### 1.3 PERFORMANCE REQUIREMENTS

A. Cold fluid applied polyurethane protected roofing/waterproofing system is intended to perform as a continuous barrier against liquid water and to flash or discharge to the exterior incidental water. Membrane system is intended to receive an overburden of insulation and ballast or concrete pavers, and shall accommodate movements of building materials as required with accessory sealant materials at locations such as: changes in substrate, perimeter conditions and penetrations.

B. Installed roofing/waterproofing membrane system shall not permit the passage of water, and will withstand the design pressures calculated in accordance with the most current revision of ASCE 7.

C. Manufacturer shall provide all primary roofing/waterproofing materials that are physically and chemically compatible when installed in accordance with manufacturers current application requirements.

### 1.4 SUBMITTALS

A. Submittals: Comply with project requirements for submittals as specified in Division 01.

B. Product Data: For each product.

C. Shop Drawings: Manufacturer’s standard details and shop drawings for the specified system.

D. Installer's Authorization: Installer shall provide written documentation from the manufacturer of their authorization to install the system, and eligibility to obtain the warranty specified in this section.

1. Applicator shall be currently approved by the waterproofing manufacturer and shall have at least 5-years' experience in installing materials of types specified and shall have successfully completed at least six projects of similar scope and complexity.
2. Applicator shall designate a single individual as Project foreman who shall be on site at all times during installation.

E. Manufacturer' Certification: Certification showing full time quality control of production facilities and that each batch of material is tested to ensure conformance with the manufacturer's published physical properties.

F. VOC Certification: Manufacturer's certification that all roofing/waterproofing system products meet current Volatile Organic Compound (VOC) regulations as established by the State in which they are being installed; and stating total VOC content, in grams per liter, for all system components (i.e. primers, adhesives, coatings, etc.).

## 1.5 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Manufacturer shall demonstrate qualifications to supply materials of this section by certifying the following:

1. Membrane Manufacturer shall show evidence that the specified membrane has been manufactured by the same organization or direct affiliate for fifteen years.
2. Membrane Manufacturer shall have available an in-house technical staff to assist the contractor when necessary in the application of the products and site review of the assembly.

B. Installer's Qualifications: The Contractor shall demonstrate qualifications to perform the Work of this Section by submitting certification or license by the roofing/waterproofing membrane manufacturer as a trained and authorized applicator of the product the installer intends to use.

C. Source Limitations: All components listed in this section shall be provided by a single manufacturer or approved by the primary roofing/waterproofing manufacturer.

D. Materials Compatibility: All materials included in the roofing/waterproofing assembly, as well as associated materials adhered to/applied beneath the roofing/waterproofing membrane shall have been tested and verified to be compatible. Include written testing documentation and test reports if requested by Architect.

E. Final Inspection: Manufacturer's representative shall provide to the Architect a comprehensive site visit report after the completion of the roofing/waterproofing system

F. Applicable Regulations: Comply with local code and requirements of authorities having jurisdiction. Do not exceed VOC regulations as established by the State in which they are being installed; including total VOC content, in grams per liter, for all system components (i.e. primers, adhesives, coatings, and similar items).

G. Roofing Terminology: Refer to ASTM D1079 and the glossary of the National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual for definitions of roofing terms related to this section.

## 1.6 PRE-INSTALLATION CONFERENCE

A. Prior to scheduled commencement of the roofing installation and associated work, conduct a meeting at the project site with the installer, architect/consultant, owner, manufacturer's representative and any other persons directly involved with the performance of the Work. The Installer shall record conference discussions and to include decisions and agreements reached (or disagreements), and furnish copies of recorded discussions to each attending party. The main purpose of this meeting is to review foreseeable methods and procedures related to the Work, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

## 1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver all roofing/waterproofing materials to the site in original containers, with factory seals intact.

B. Store all pail goods in their original undamaged containers in a clean, dry location within their specified temperature range.

C. Do not expose materials to moisture in any form before, during, or after delivery to the site. Reject delivery of materials that show evidence of contact with moisture.

D. Remove manufacturer supplied plastic covers from materials provided with such. Use "breathable" type covers such as canvas tarpaulins to allow venting and protection from weather and moisture. Cover and protect materials at the end of each work day. Do not remove any protective tarpaulins until immediately before the material will be installed.

E. Materials shall be stored above 55°F (12.6°C) a minimum of 24 hours prior to application

## 1.8 PROJECT CONDITIONS

A. Weather: Proceed with roofing/waterproofing only when existing and forecasted weather conditions permit. Membrane application can proceed when precipitation is imminent. Sikalastic RoofPro is capable of curing in immersion immediately after application. Visual marks in the form of pock marks may occur if uncured membrane is exposed to heavy rainfall, but is not considered a limiting factor in the performance of the roofing membrane. Ambient temperatures shall be above 36°F (2°C) when applying the roofing/waterproofing system.

B. All surfaces to receive the roofing/waterproofing membrane shall be free from visible water, dew, frost, snow and ice. Surfaces shall be broom clean, dry, sound and free of voids, holes, rock pockets, honeycombs, protrusions, excessive roughness, foreign matter, and other contaminants which may inhibit application or performance of the waterproofing membrane roofing system. Application of roofing/waterproofing membrane shall be conducted in well ventilated areas.

C. Roofing Membrane:

1. Roofing/waterproofing membrane is not intended to be exposed or in contact with a constant temperature below -22°F (-30°C) or in excess of 176°F (80°C). See technical data sheets for limitations, i.e., hot pipes and vents or direct steam venting.
2. Specified roofing/waterproofing membrane is non-flammable and VOC compliant. Consult container, packaging labels and Material Safety Data Sheets (MSDS) for specific safety information.
3. Specified roofing/waterproofing membrane is resistant to gasoline, paraffin, fuel oil, mineral spirits, and moderate solutions of acids and alkalis, acid rain and detergents. Some low

molecular weight alcohols can soften. Any exposure to foreign materials or chemical discharges shall be presented to membrane manufacturer for evaluation to determine any impact on the waterproof membrane assembly performance prior to warranty issuance.

D. Contractor shall ensure adequate protection during installation of the roofing/waterproofing system.

E. Specified roofing/waterproofing membrane may be used as a temporary roofing/waterproofing barrier when applied at a wet film thickness of 15-20 mils to a properly prepared deck. When the specified roofing/waterproofing membrane is used as a temporary roofing/waterproofing barrier the roofing/waterproofing membrane does not need to be removed prior to installation of the finished roofing/waterproofing system

### 1.9 WARRANTY

A. Warranty: Provide manufacturer's standard warranty. Materials warranty shall be for a minimum of one year starting at the date of Substantial Completion. System warranty shall be for the following duration in accordance with specified system.

1. Warranty Length: 10 years.
2. Warranty Length: 15 years.
3. Warranty Length: 20 years.
4. Warranty Length: 25 years.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURER

A. Basis-of-Design Manufacturer: Sika Corporation, 201 Polito Avenue, Lyndhurst NJ 07071. Toll Free 800-933-SIKA (7452), www.sikausa.com. No substitutions without prior written approval by the Architect.

B. Provide a complete fluid applied elastomeric waterproofing roofing membrane system subject to hydrostatic head that is polyurethane and coal-tar free.

### 2.2 ROOFING SYSTEM

A. Fluid-Applied Membrane System, 15 Year Warranty: Sikalastic RoofPro WP 15, Premium Reemat:

1. Base Layer: Sikalastic 644 Lo-VOC, 45 mils wet film thickness; 35 sf/gal coverage rate approx.
2. Top Layer: Sikalastic 644 Lo-VOC, 25 mils wet film thickness; 64 sf/gal coverage rate approx.

B. Fluid-Applied Membrane System, 15 Year Warranty: Sikalastic RoofPro WP 15, 120 Sika Fleece:

1. Base Layer: Sikalastic 644 Lo-VOC, 45 mils wet film thickness; 35 sf/gal coverage rate approx.
2. Top Layer: Sikalastic 644 Lo-VOC, 25 mils wet film thickness; 64 sf/gal coverage rate approx.

C. Fluid-Applied Membrane System, 20 Year Warranty: Sikalastic RoofPro WP 20, Premium Reemat:

1. Base Layer: Sikalastic 644 Lo-VOC, 45 mils wet film thickness; 35 sf/gal coverage rate approx.
2. Top Layer 1: Sikalastic 644 Lo-VOC, 30 mils wet film thickness; 53 sf/gal coverage rate approx.

D. Fluid-Applied Membrane System, 20 Year Warranty, Sikalastic RoofPro WP 20, Sika 140 Fleece:

1. Base Layer: Sikalastic 644 Lo-VOC, 50 mils wet film thickness; 32 sf/gal coverage rate approx.
2. Top Layer: Sikalastic 644 Lo-VOC, 25 mils wet film thickness; 64 sf/gal coverage rate approx.

E. Fluid-Applied Membrane System, 25 Year Warranty: Sikalastic RoofPro 25 WP, Premium Reemat:

1. Base Layer: Sikalastic 644 Lo-VOC, 45 mils wet film thickness; 35 sf/gal coverage rate approx.
2. Top Layer #1: Sikalastic 644 Lo-VOC, 25 mils wet film thickness; 64 sf/gal coverage rate approx.
3. Top Layer #2: Sikalastic 644 Lo-VOC, 25 mils wet film thickness; 64 sf/gal coverage rate approx.

F. Fluid-Applied Membrane System, 25 Year Warranty: Sikalastic RoofPro WP 25, Sika 170 Fleece:

1. Base Layer: Sikalastic 644 Lo-VOC, 60 mils wet film thickness; 27 sf/gal coverage rate approx.
2. Top Layer: Sikalastic 644 Lo-VOC, 35 mils wet film thickness; 45 sf/gal coverage rate approx.

## 2.3 MEMBRANES AND COATINGS

A. Base embedment coat with Reemat reinforcement shall be Sikalastic 644 Lo-VOC by Sika Corp, a single component, cold, fluid applied, moisture triggered, aliphatic, polyurethane base coat membrane.

B. Base embedment coat with Fleece reinforcement shall be Sikalastic 644 Lo-VOC by Sika Corp, a single component, cold, fluid applied, moisture triggered, aliphatic, polyurethane base coat membrane.

C. Top coat with both Reemat and Fleece reinforcement shall be Sikalastic 644 Lo-VOC by Sika Corp, a single component, cold, fluid applied, moisture triggered, aliphatic, polyurethane top coat membrane.

D. Base coat and top coat membranes shall be a one component, low VOC elastomeric polyurethane membrane that may be brush or roller applied. Membrane shall have the following physical properties and conforms to ASTM D7311-07: Standard Specification for Liquid Applied, Single Component, Moisture-Triggered, Aliphatic Polyurethanes used in Roofing.

E. Liquid Property Requirements:

1. VOC Content, ASTM D-2369-81: < 50 g/l

2. Volume Solids, ASTM D2697: 76% minimum.
3. Weight Solids: ASTM D1644: 83% minimum.
4. Sag Resistance, ASTM D4400: No sag at 700 micrometers (0.028 in. / 28 mil)

F. Film Physical Property Requirements:

1. Tensile Strength (Tension): ASTM D412: Minimum 1.86 MPa (270lb/in2)
2. Elongation: ASTM D412: MIN 200%.
3. Accelerated Weathering FL/UV – 5000 Hours, ASTM G 154, No cracking or checking.
4. Water Vapor Transmission, Permeability / Permeance: ASTM E96: Maximum 8.5 gms/m2/ day (0.033 perm-inches).
5. Flexibility – Mandrel Bend, ASTM D522: Pass, no cracking or flaking.
6. Tear Resistance, ASTM D625: Minimum 5.8 kN/m (33 lbf/in)
7. Indentation Hardness, ASTM D2240: 82 Durometer Units (+/- 5 units)
8. Dynamic Puncture Resistance, ASTM D5635: Minimum 15 joules (357 ft.pounds)
9. Static Puncture Resistance, ASTM D5602: Minimum 20.7 kg. (45.5 lbs.)

## 2.4 MEMBRANE REINFORCEMENT - FIBERGLASS

A. Reinforcement for the roofing/waterproofing membrane system shall be Sika Reemat by Sika Corp, a conformable, random strand fiberglass mat specifically designed to provide greater impact resistance and greater resistance to excessive thermal and structural movement while maintaining elasticity and membrane film integrity.

B. Supplemental reinforcement of the roofing/waterproofing membrane system shall be Sika Flexitape Heavy by Sika Corp, a nylon mesh specifically designed for local reinforcement of the roofing/waterproofing membrane at structural cracks, expansion joints and transitions between dissimilar materials.

## 2.5 MEMBRANE REINFORCEMENT - POLYESTER

A. Reinforcement for the roofing/waterproofing membrane system shall be Sika Fleece by Sika Corp., a non-woven, needle-punched polyester fleece specifically designed to provide greater impact resistance and greater resistance to excessive thermal and structural movement while maintaining elasticity and membrane film integrity.

B. Supplemental reinforcement of the roofing/waterproofing membrane system shall be Sika Flexitape Heavy by Sika Corp, a nylon mesh specifically designed for local reinforcement of the roofing/waterproofing membrane at structural cracks, expansion joints and transitions between dissimilar materials.

## 2.6 FILLET BEAD AND PENETRATION SEALANT

A. Sealant for fillet bead applications and membrane penetrations shall be Sikaflex 11FC by Sika Corp., a one part polyurethane sealant suitable for fillet bead transition compound to be applied prior to the installation of the membrane system at changes in substrate direction, sealing reglet terminations, cracks in the substrate and penetrations of the roof /waterproofing system.

## 2.7 PRIMERS

A. Primer for concrete and roof cover boards shall be Sika Concrete Primer by Sika Corp., a two-component, rapid curing, high solids, solvent based polyurea primer designed for sealing cementitious and gypsum based substrates. Alternative Primer for concrete and roof cover boards

shall be Sika Concrete Primer Lo VOC by Sika Corp, a single component rapid curing high solids and low VOC solvent based Polyurethane Primer.

B. Water based primer for concrete, roof cover boards, masonry and previously coated surfaces shall be Sika Bonding Primer by Sika Corp., a fast-drying, two-component, water-based, adducted polyamide epoxy primer.

C. Epoxy primer for green concrete shall be Sikalastic DTE Primer by Sika Corp., a two-component, solvent free, epoxy primer specifically designed to be applied to damp or new concrete susceptible to high moisture drive prior to the application of roofing/waterproofing systems.

D. Metal primer shall be Sikalastic EP Primer/Sealer by Sika Corp., a two-component, cyclo-aliphatic, amine cured material with a high level of corrosion resistance for metal, modified bitumen surfaces, and chemically treated wood.

E. Membrane over-coating primer shall be Sika Reactivation Primer by Sika Corp., a single component polyurethane based primer specifically designed for the reactivation of existing roof /waterproofing system applications prior to membrane over-coating.

## 2.8 CONCRETE REPAIR AND PATCHING

A. Cementitious repair mortar to repair bug holes, spalled areas, and other non-structural surface defects, to fill uneven areas and birdbaths, or to repitch decks shall be SikaQuick 1000 by Sika Corp., a two component, polymer-modified, Portland cement, fast-setting, trowel-grade mortar.

## 2.9 MECHANICAL FASTENERS

A. Mechanical fasteners and plates for cover board/thermal barrier securement shall meet requirements of Factory Mutual, and be of appropriate type and length for structural deck substrate.

B. #12 or #14 screw-type fasteners for steel decks shall penetrate through the steel deck a minimum of ½”.

C. #12 or #14 screw-type fasteners for wood decks shall achieve a minimum of 1” penetration depth into the wood or shall penetrate through the wood deck a minimum of ¼”.

D. #14 screw-type or drive spike fasteners for concrete decks shall achieve a minimum of penetration depth into the concrete. Predrilling of the concrete deck is required.

E. All fasteners shall be installed with 3” diameter galvalume plates.

F. Fasteners and plates shall be by OMG, Inc.

## 2.10 DRAINAGE MAT

A. Geonet polypropylene composite drainage mat with a non-woven polypropylene filter fabric bonded to the topside of the mat, and a bonded protection sheet on the underside of the mat. To be installed between the roofing membrane and extruded polystyrene insulation. Drainage mat to be Sika Drainage Mat 1000.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Verify that surfaces and conditions are ready to accept the Work of this section. Notify Architect in writing of any discrepancies. Commencement of the Work in an area shall mean Installer's acceptance of the substrate.

B. Surfaces shall be sound, dry, clean and free of oil, grease, dirt, excess mortar or other contaminants. Fill voids, gaps and spalled areas in substrate to provide an even plane. Strike masonry joints full flush.

C. Examine roof edges, framing, flashings, openings, substrates and junctures at other construction for suitable conditions where the system will be installed. Ensure that Work done by other trades is complete and ready for the systems to be installed. Verify compatibility with and suitability of flashings, materials and substrates.

### 3.2 SURFACE PREPARATION

A. Verify that the deck is clean and smooth, free of depressions, waves, or projections, and properly sloped to drains, valleys, eaves, scuppers or gutters. Verify that all roof openings or penetrations through the roof are secured back to solid blocking. Ensure all preparatory Work is complete prior to applying membrane.

B. Mechanical fasteners used to secure sheathing boards or penetrate sheathing boards shall be set flush with sheathing and fastened into solid backing.

C. All surfaces shall be blown clean using an air compressor to remove any remaining loose debris.

D. All cracks and voids greater than 0.040 inches shall be routed and caulked with a polyurethane sealant. Allow to cure per roof /waterproofing membrane manufacturer's technical data sheets prior to over-coating with the specified roof /waterproofing membrane system.

E. At all inside corners, gaps or voids at the juncture of the deck and penetrations apply a minimum 3/4 inch fillet bead of polyurethane sealant and allow to cure per roof /waterproofing membrane manufacturer's technical data sheets prior to installing the roof /waterproofing membrane system.

F. At all moving cracks, moving joints between dissimilar materials, and similar conditions, create a minimum 1 inch wide bond break utilizing bond breaker tape, centered over the crack or joint.

G. Membrane terminations shall be established prior to project start-up and documented in shop drawings. Terminations shall occur in raked-out mortar joints, saw cut terminations or under installed counter-flashing materials.

H. Use tape lines to achieve a straight edge detail.

### 3.3 SUBSTRATE PREPARATION

A. Acceptable substrates include concrete, concrete block, solid wood/plywood sheathing, cover board/thermal barriers and metal.

B. Structural Concrete:

1. Acceptable concrete substrates are limited to poured in place concrete decks.

2. Minimum deck thickness for structural concrete is 4 inches (10.2 cm).
3. Concrete surface to be light broom finish or equivalent as required by manufacturer.
4. Curing agents shall be checked for compatibility with specified roofing/waterproofing materials. Most curing agents shall be completely removed from the substrate by grinding, scarifying, or other mechanical means.
5. Concrete and masonry surfaces shall be low-pressure (5,000 psi or less) power-washed in accordance with ICRI Guideline No. 03732: Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays to remove all dirt, debris or surface contamination that would compromise bonding of the specified roofing/waterproofing membrane system. Remove oil or grease with solvents, or detergent and water. Rinse surface clean of remaining cleaning agents.

C. Metal Surfaces:

1. Exposed drain bowls, pipes, and other metal surfaces shall be cleaned by power tool cleaning (SSPC SP-3) to remove corrosion deposits back to a clean, bright metal followed by a solvent wipe prior to application of the specified primer.

## 3.4 PRIMING

A. Concrete, Masonry, Cover Boards, and Wood:

1. Mix and apply specified primer for concrete/masonry/wood surfaces by brush or roller at the application rate shown on the technical data sheet. Porous, rough or absorbent surfaces will decrease coverage rates.
2. Allow to cure and dry in accordance with manufacturer's technical data sheets.

B. Metal:

1. Apply specified primer for metal surfaces to clean and prepared drain bowls and other metal surfaces by brush or roller at the application rate shown on the technical data sheet to achieve an overall wet film thickness of 6-8 mils. High porosity and roughness of the substrate will decrease coverage rates.
2. Allow to cure and dry in accordance with manufacturer's technical data sheets.

C. Existing Membrane Tie-In:

1. Apply specified reactivation primer to existing roof/waterproofing membrane greater than seven (7) days old by roller at a maximum coverage rate of 250 sf/gallon. Allow to cure in accordance with manufacturer's technical data sheets prior to application of subsequent roof/waterproofing membrane system.

## 3.5 MEMBRANE REINFORCEMENT

A. Reinforcement of Cracks, Plywood and Cover Board Joints, and Base/Curb Flashing Transitions:

1. For all locations where the specified membrane system is to be applied directly to the substrate surface, provide reinforcement of cracks and joints prior to applying the specified membrane system
2. For all moving cracks and joints, create a minimum 1 inch wide bond break centered over the crack or joint by applying bond break tape centered over each crack or joint.
3. For all non-moving cracks and joints, rout and seal with Sikaflex polyurethane sealant.
4. For all horizontal-to-vertical transitions, provide a ¾" x ¾" Sikaflex polyurethane sealant cant.

5. Apply a minimum of a 3 inch wide strip of Sika Joint Tape SA directly, or alternatively Flexitape Heavy membrane reinforcement into a bed of liquid roofing/waterproofing membrane. Back roll reinforcement to fully embed reinforcement into the wet liquid polyurethane membrane. Add more liquid membrane as needed to fully embed the reinforcement.
6. Ensure reinforcement is not in tension during embedment.

## 3.6 COLD FLUID APPLIED MEMBRANE APPLICATION

A. Install roofing/waterproofing membrane system in accordance with current technical data sheets and in accordance with Part 2 Section 2.2. Though no ASTM Standard addresses this specific installation, membrane roofing system shall align with the requirements of ASTM C898/C898M.

B. Apply base embedment coat to horizontal deck and vertical wall surfaces by brush or with 1/2 inch – 3/4 inch nap roller to achieve a continuous and uniform minimum wet film thicknesses as specified in Part 2 section 2.2. For fleece applications, approximately 2/3 of the total resin shall be applied as the base embedment coat.

C. Immediately lay specified conformable reinforcement into the wet base embedment resin coat. Reemat reinforcement is typically precut before application; Fleece reinforcement is typically precut at flashings only before application.

D. Apply pressure to the membrane reinforcement with a roller as appropriate to fully embed and saturate the membrane reinforcement into liquid roofing/waterproofing material. Remove air pockets from under the membrane by rolling them out.

E. Apply additional liquid material as required to ensure the membrane reinforcement is fully embedded and has conformed to the substrate without tenting or visible pinholes.

F. Overlap sheets of Reemat membrane reinforcement a minimum of 2 inches in all directions. Overlap sheets of Fleece membrane reinforcement 3 inches at side laps and 6 inches at end laps.

G. Extend membrane reinforcement vertically at adjacent wall surfaces in accordance with project details and specifications.

H. When using fiberglass mat reinforcement, allow the base embedment coat to fully cure dry prior to the placement of top coat or other applications of the specified roofing/waterproofing material.

I. When using polyester fleece reinforcement, immediately apply the resin top coat wet-on-wet.

J. Apply top coat by nap roller or brush to achieve a continuous and uniform minimum wet film thickness as specified in Part 2 Section 2.2.

K. Install all flashings in accordance with manufacturer’s construction details.

## 3.7 PARAPET AND WALL FLASHINGS

A. Clean, prepare and prime flashing substrate surfaces ready to receive membrane flashing applications.

B. All parapet, wall, and curb flashings shall be provided with a sealant cant with Flexitape reinforcement prior to flashing application.

C. Terminate roofing/waterproofing membrane system at raked-out mortar joints, termination saw cut joint, or under installed counter-flashing materials. Seal all mortar joints and saw cut joints with Sikaflex polyurethane sealant.

D. Install metal counter flashings in accordance with details.

**3.8 DRIP EDGES AND OTHER METAL FLANGED FLASHING**

A. Scuff, clean, prepare and prime metal flange surfaces ready to receive membrane flashing applications.

B. Metal flanges are typically encapsulated between two membrane layers, usually by providing membrane flashing as a stripping ply over the metal flange, with the field or flashing membrane extending beneath the metal flange. It is also acceptable to install the stripping ply under the metal flange, and extend the field or flashing membrane over the metal flange.

C. For insulated roof assemblies, metal flanges shall be mechanically fastened through the first membrane layer to wood nailers. For direct to substrate membrane applications where the roof / waterproofing membrane is applied directly to the structural deck, metal flanges shall be mechanically fastened through the first membrane layer to the structural deck.

**3.9 ROOF DRAINS**

A. Clean, prepare and prime surfaces ready to receive membrane applications. Block drain bowl opening to avoid roofing/waterproofing material from entering the drainage system.

B. Remove strainer baskets and clamping rings from the drain bowl assembly. Temporarily replace the bolts back into assembly to avoid miss-alignment of connections after membrane applications are completed.

C. Extend the liquid roofing/ waterproofing material and membrane reinforcement directly into the throat of the prepared drain.

D. Remove drain blocks and allow the roofing/waterproofing system to fully cure dry prior to re-connecting the drain bowl assembly.

**3.10 ROOF PENETRATIONS**

A. Clean, prepare and prime surfaces ready to receive membrane flashing applications. Ensure that penetrations are secured to prevent movement.

B. Penetration flashings typically consist of two components. A vertical flashing component extends up the penetration and is torn (if Reemat reinforcement) or finger cut (if fleece reinforcement) at the bottom so that it can be extended horizontally onto the deck/substrate. A horizontal flashing component covers all of the tears/finger cuts and extends vertically up the penetration. The intent is to achieve a 2-3 inch overlap of the two flashing components.

**3.11 EXPANSION JOINTS**

A. Clean, prepare and prime surfaces ready to receive membrane flashing applications. For insulated roof assemblies, wood nailers shall be installed as insulation stops prior to expansion joint flashing application.

B. Expansion joints shall be sealed with a compressible filler such as batt insulation to prevent condensation and to provide support for the flashing bellows.

C. Expansion joint flashings typically consist of four components. An initial reinforced membrane cradle of 6” wide Flexitape Heavy or Fleece is installed first, followed by a compressible foam rod under 25% compression, extending equally above and below the membrane level. A second reinforced membrane layer is installed over the foam rod to create a bellows. A third reinforced membrane layer is installed over the bellows. It is acceptable to use the flashing or roof / waterproofing membrane as the final layer.

## 3.12 AGGREGATE SURFACING

A. Apply aggregate surfacing as specified for protective layer.

B. Apply an additional 15 wet mil layer of Sikalastic 624 WP resin to cured roofing/waterproofing membrane as soon as membrane can be walked on without damage.

C. Broadcast kiln-dried sand to refusal into the wet resin layer and allow to cure. Remove all loose sand/aggregate. Apply an additional 15 wet mil layer of Sikalastic 624 WP resin to seal kiln-dried sand.

## 3.13 APPLICATION OF PENETRATION SEALANT

A. Seal reglet-based membrane terminations, heads of exposed mechanical fasteners, around penetrations, duct work, electrical and other apparatus extending through the roofing/waterproofing membrane with specified penetration sealant.

## 3.14 FLOOD TEST

A. Upon the completion of the roofing/waterproofing membrane system and associated terminations the contractor shall flood test the system. Provide temporary stops and plugs for the roof drains within the test area. Flood test with a minimum 2 inches of water for no less than 24 hours.

B. Repair and retest the system for no less than 24 hours, report all deficiencies to the Architect. Remove temporary stops and plugs. No other Work is to proceed without prior direction from the Architect.

## 3.15 ROOF PROTECTION

A. Protect roofing/waterproofing Work from other trades until completion.

B. Stage materials in such a manner that avoids foot traffic over completed roof areas.

C. Provide temporary walkways and platforms to protect completed Work from traffic and point loading during the application process.

D. Provide temporary membrane tie-ins and water-stops at the end of each workday and remove prior to commencement of Work the following day.

## 3.16 PREFABRICATED COMPOSITE DRAINAGE AND PROTECTION MAT

A. Install the drainage mat when it can be followed immediately by the installation of the extruded polystyrene insulation and pavers/ballast.

B. Install the drainage mat on horizontal and vertical surfaces in accordance with the product data sheet. Lay out and position drainage mat, and allow to lay flat. Cut and closely fit drainage mat to perimeter and penetrations.

C. Overlap filter fabric from adjacent sheets/rolls, and bond all fabric overlaps with Sikaflex sealant. Install supplemental filter fabric as required to ensure filter fabric continuity at flashing locations.

**3.17 INSTALLATION OF EXTRUDED POLYSTYRENE INSULATION**

A. Before the application of the insulation, any damage or deterioration to the composite drainage and protection mat shall be repaired.

B. Loose lay insulation in a staggered manner, and tightly butt together all insulation boards. The maximum acceptable joint width is 3/8 inch. Cut and closely fit insulation within ¾ inches to perimeter and penetrations.

C. For multi-layer insulation applications, the bottom layer shall be the thickest layer and shall be a minimum of 2 inches thick. Stagger the joints of each insulation layer.

D. Vertical insulation applications can be spot-adhered to the drainage mat and to additional insulation layers, utilizing an acceptable adhesive.

E. Do not install damaged insulation boards.

**3.18 FILTER FABRIC**

A. Install filter fabric on horizontal and vertical surfaces over the extruded polystyrene insulation in accordance with the product data sheet.

B. Lay out and position filter fabric. Cut and closely fit filter fabric to perimeter and penetrations, extending the filter fabric vertically to the height of the overburden.

C. Overlap filter fabric to achieve 6 inch side and end laps. As required, bond all fabric overlaps with Sikaflex sealant to ensure filter fabric continuity prior to and during overburden installation.

**3.19 CLEAN-UP**

A. Work areas are to be kept clean, clear and free of debris at all times.

B. Do not allow trash, waste, and/or debris to collect on the roof deck area. Trash, waste, and/or debris shall be removed from the roof on a daily basis.

C. All tools and unused materials shall be collected at the end of each workday and stored properly off of the finished roof surface and protected from exposure to the elements.

D. Dispose of or recycle all trash and excess material in a manner conforming to current EPA regulations and local laws.

E. Properly clean the finished roof surface after completion, and make sure the drains and gutters are not clogged.

F. Clean and restore all damaged surfaces to their original condition

**END OF SECTION**

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

A. Silicone joint sealants.
B. Urethane joint sealants.
C. Latex joint sealants.

**SECTION 07 92 00 JOINT SEALANTS**

### 1.2 RELATED REQUIREMENTS:

A. Section 04 20 00 - Unit Masonry: masonry control and expansion joint fillers and gaskets.
B. Section 07 95 00 - Expansion Control: building expansion joints.
C. Section 32 1313 – Portland Cement and Concrete Paving

### 1.3 PERFORMANCE REQUIREMENTS

A. Provide joint sealants for interior and exterior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

### 1.4 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
   1. Use manufacturer's standard test method, to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
   2. Submit not fewer than eight pieces of each kind of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
   3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
   5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.
B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:
   1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
   2. Conduct field tests for each application indicated below:
      a. Each kind of sealant and joint substrate indicated.
   3. Notify Architect seven days in advance of dates and times when test joints will be erected.
   4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.
      a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

## 1.5 SUBMITTALS

A. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and colors available for each joint sealant specified.

B. Samples for Initial Selection: Manufacturer's standard bead samples consisting of strips of actual products showing full range of colors available for each product exposed to view. Pre-formed Expanded Foam Sealant System consisting of same materials to be used in the work.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch wide joints formed between two 6-inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:
   1. Joint-sealant application, joint location, and designation.
   2. Joint-sealant manufacturer and product name.
   3. Joint-sealant formulation.
   4. Joint-sealant color.

E. Qualification Data: For qualified Installer.

F. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

G. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI's Sealant Validation Program.

H. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

I. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
   1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
   2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

J. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

K. Field-Adhesion Test Reports: For each sealant application tested.

L. Warranties: Sample of special warranties.

## 1.6 QUALITY ASSURANCE

A. Perform work in accordance with SWRI (Sealant, Waterproofing and Restoration Institute) and in accordance with sealant manufacturer’s requirements for preparation of surfaces and material installation instructions.

B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
   1. Engage an Installer who has successfully completed within the last 3-years at least 3 projects of similar size and scope.

   2. To ensure continuity of weatherseal for all exterior sealants one sealant installer shall perform the work.

C. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

D. Compliance with applicable ASTM Standards, including but not limited to:
   1. ASTM C509 - Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material.
   2. ASTM C834 - Standard Specification for Latex Sealants.
   3. ASTM C920 - Standard Specification for Elastomeric Joint Sealants.
   4. ASTM C1193 - Standard Guide for Use of Joint Sealants.

E. Product Testing: Test joint sealants using a qualified testing agency.
   1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
   2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

F. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

G. Pre-installation Conference: Conduct conference at project site.

## 1.7 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

B. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with the adhesion are removed from joint substrates.

C. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.

D. Sequence installation of joint sealants to occur not less than 21 or more than 30 days after completion of waterproofing, unless otherwise indicated.

## 1.8 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: 15 years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
   1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.

2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

## PART 2 PRODUCTS

### 2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):
   1. Architectural Sealants: 250 g/L.
   2. Sealant Primers for Nonporous Substrates: 250 g/L.
   3. Sealant Primers for Porous Substrates: 775 g/L.

C. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
   1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

D. Stain-Test-Response Characteristics: Where sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

E. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food; provide products that comply with 21 CFR 177.2600.

F. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

### 2.2 SILICONE JOINT SEALANTS

A. Single-Component, Non-sag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Dow Corning Corporation; 791 Silicone Sealant.
      b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
      c. Sika Corporation, Construction Products Division; SikaSil-C990.

B. Single-Component, Nonsag, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use T.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      a. Dow Corning Corporation; 790 Silicone Sealant.
      b. Pecora Corporation; 301 NS.
      c. Tremco Incorporated; Spectrem 800.

C. Single-Component, Pourable, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade P, Class 100/50, for Use T.
   1. Products: Subject to compliance with requirements, available products that may be

incorporated into the Work include, but are not limited to, the following:
a. Dow Corning Corporation; 890-SLSL Parking Structure Sealant.
b. Pecora Corporation; 300 SL.
c. Tremco Incorporated; Spectrem 901 .

D. Mildew-Resistant, Single-Component, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Dow Corning Corporation; 786 Mildew Resistant.
b. GE Advanced Materials - Silicones; Sanitary SCS1700.
c. Tremco Incorporated; Tremsil 200 Sanitary.

## 2.3 URETHANE JOINT SEALANTS

A. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
a. Sika Corporation, Construction Products Division; Sikaflex - 15LM.
b. Tremco Incorporated; Dymonic.

B. Single-Component, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920. Type S, Grade NS, Class 25, for Use T.
1. Products: Subject to compliance with requirements, provide one of the following:
a. BASF Building Systems; Sonolastic NP1.
b. May National Associates, Inc.; Bondaflex PUR 40 FC.
c. Pacific Polymers International, Inc.; Elasto-Thane 230 Type II.
d. Sika Corporation, Construction Products Division; Sikaflex - 1a.
e. Tremco Incorporated; Vulkem 116.
f. Top Industrial; RainBuster 900.

C. Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use NT.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Pecora Corporation; Dynatrol II.
b. Polymeric Systems, Inc.; PSI-270.
c. Tremco Incorporated; Dymeric 240 FC.

D. Multicomponent, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use T.
1. Products: Subject to compliance with requirements, provide one of the following:
a. Polymeric Systems, Inc.; PSI-270.
b. Tremco Incorporated; Dymeric 240 FC.

E. Immersible, Single-Component, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Uses T and I.
1. Products: Subject to compliance with requirements, provide one of the following:
a. BASF Building Systems; Sonolastic NP1.
b. Sika Corporation, Construction Products Division; Sikaflex - 1a.
c. Tremco Incorporated; Vulkem 116.

F. Immersible Multicomponent, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C 920.

Type M, Grade P, Class 25, for Use T and I.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. LymTal International, Inc.; Iso-Flex 880 GB.
   b. May National Associates, Inc.; Bondaflex PUR 2 SL.
   c. Tremco Incorporated; Vulkem 245.

## 2.4 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. BASF Building Systems; Sonolac.
   b. Bostik, Inc.; Chem-Calk 600.
   c. Pecora Corporation; AC-20+.
   d. Schnee-Morehead, Inc.; SM 8200.
   e. Tremco Incorporated; Tremflex 834.

## 2.5 PREFORMED JOINT SEALANTS

A. Preformed Silicone Joint Sealants: Manufacturer's standard sealant consisting of precured low-modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral-curing silicone sealant for bonding extrusions to substrates.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Dow Corning Corporation; 123 Silicone Seal.
   b. GE Advanced Materials - Silicones; UltraSpan US1100.
   c. Pecora Corporation; Sil-Span.

B. Preformed Foam Joint Sealant: Manufacturer's standard preformed, precompressed, open-cell foam sealant manufactured from urethane foam with minimum density of 10 lb/cu. ft. and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths indicated; coated on one side with a pressure-sensitive adhesive and covered with protective wrapping.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Dayton Superior Specialty Chemicals; Polytite Standard.
   b. EMSEAL Joint Systems, Ltd.; Emseal 25V.
   c. Sandell Manufacturing Co., Inc.; Polyseal.

## 2.6 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type O open-cell material or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

## 2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of

sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

## PART 3 EXECUTION

### 3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

1. Examine roof edges, wall framing, flashings, openings, substrates and junctures at other construction for suitable conditions where the system will be installed.
2. Ensure that Work done by other trades is complete and ready for the systems to be installed.
3. Notify Architect and Owner's waterproofing representative in writing of conditions which may adversely affect the system installation or performance. Do not proceed with installation until these conditions have been corrected and reviewed by the Architect and Owner's waterproofing representative.
4. Verify compatibility with and suitability of flashings, materials and substrates.

### 3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
   a. Concrete.
   b. Masonry.
   c. Unglazed surfaces of ceramic tile.
   d. Exterior insulation and finish systems.
3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
   a. Metal.
   b. Glass.
   c. Porcelain enamel.

d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

## 3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.
   a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:
1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch. Hold edge of sealant bead 1/4 inch inside masking tape.
3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.

4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

H. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material. Produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures, apply heat to sealant in compliance with sealant manufacturer's written instructions.

I. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

## 3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
   1. Extent of Testing: Test completed and cured sealant joints as follows:
      a. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor per elevation.
   2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
      a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
   3. Inspect tested joints and report on the following:
      a. Whether sealants filled joint cavities and are free of voids.
      b. Whether sealant dimensions and configurations comply with specified requirements.
      c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
   4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
   5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

## 3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

## 3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances

and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

### 3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces JS#1.
   1. Joint Locations:
      a. Isolation and contraction joints in cast-in-place concrete.
      b. Joints between plant-precast architectural concrete.
      c. Tile control and expansion joints.
      d. Joints between different materials listed above.
      e. Other joints as indicated.
   2. Silicone Joint Sealant: Single component, nonsag, traffic grade, neutral curing [Single component, pourable, traffic grade, neutral curing] [Multicomponent, pourable, traffic grade, neutral curing.
   3. Urethane Joint Sealant: Multicomponent, nonsag, traffic grade, Class 25.
   4. Preformed Joint Sealant: Preformed foam sealant.
   5. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces subject to water immersion JS# 2.
   1. Joint Locations:
      a. Other joints as indicated.
   2. Urethane Joint Sealant: Immersible, single component, nonsag, traffic grade.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces JS # 3.
   1. Joint Locations:
      a. Construction joints in cast-in-place concrete.
      b. Joints between plant-precast architectural concrete units.
      c. Control and expansion joints in unit masonry.
      d. Joints in dimension stone cladding.
      e. Joints in glass unit masonry assemblies.
      f. Joints in exterior insulation and finish systems.
      g. Joints between different materials listed above.
      h. Perimeter joints between materials listed above and frames of doors, windows and louvers.
      i. Control and expansion joints in ceilings and others
   2. Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 100/50.
   3. Urethane Joint Sealant: Single component, nonsag, Class 100/50.
   4. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces JS # 4
   1. Joint Sealant Location:
      a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
      b. Tile control and expansion joints where indicated.
      c. Other joints as indicated.
   2. Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, Silicone.

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

**END OF SECTION**

**SECTION 08 11 16**

**ALUMINUM DOORS & FRAMES**

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:
1. Flush aluminum exterior doors
2. Aluminum panels
3. Aluminum door frames

B. Related Sections:
1. Section 06 10 00 - Rough Carpentry (hardware installation).
2. Section 04 20 00 - Masonry (frame installation).
3. Section 07 90 00 - Joint Sealers.
4. Section 08 71 00 - Door Hardware.
5. Section 08 80 00 - Glazing.
6. Section 09 90 00 - Field Painting.

### 1.2 REFERENCES

A. Aluminum Association, Inc. (AA).
1. AA 5005-H14 — Sheet Architectural.
2. AA 6061-T6 — Heavy Duty Structures.
3. AA 6063-T5 — Extrusions, Pipe, Architectural.
4. AA DAF-45 — Designation System for Aluminum Finishes.

B. American Architectural Manufacturers Association (AAMA).
1. AAMA 2603-98 — Pigmented Organic Coatings (Polycron).
2. AAMA 2605-98 — Superior Performing Organic Coatings (Kynar).
3. AAMA 609 — Anodized Architectural Finishes Cleaning and Maintenance.
4. AAMA 610-02 — Painted Architectural Products Cleaning and Maintenance.
5. AAMA 611-98 — Anodized Architectural Standards.
6. AAMA 701 — Pile Weather strip.

C. American Society for Testing Materials (ASTM).
1. A 123 — Zinc (Hot-Dip Galvanized) Coatings.
2. C 728-97 — Insulation Board, Mineral Aggregate.
3. E 330-97 — Structural Load Test.
4. E 1996 — Wind Load Test.
5. E 1886 — Impact Test Procedures (Inclusive of Large Missile Impact).
6. E 1300 — Load Resistance of Glass in Building.

D. Florida Building Code Compliant
1. Florida Building Code #FL6336 (website address: www.floridabuilding.org)

### 1.3 TESTING AND PERFORMANCE REQUIREMENTS

A. Structural Test Unit: Minimum size of 3-feet (91.44 cm) by 7-feet (213.36 cm) with 24-inch (60.96 cm) by 34-inch (86.36 cm) vision light shall be evaluated compliant with ASTM E 330 testing method.

B. Test Procedures and Performances:
1. With door closed and locked, test unit in accordance with ASTM E 330 at static air pressure difference of 90.0 pounds per square foot (3.35 kPa) positive pressure and 90.0 pounds per square foot negative pressure.
2. At conclusion of test there shall be no glass breakage, permanent damage to fasteners, hardware parts, support arms or actuating mechanism, nor any other damage that would cause the door to be inoperable.

## 1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Manufacturer's descriptive literature for each type door and frame, include the following information:
1. Fabrication methods.
2. Finishing.
3. Hardware preparation.

C. Shop Drawings: Indicate the following:
1. Elevations and details of each door and frame type.
2. Schedule of doors and frames.
3. Conditions at openings with various wall thicknesses and materials.
4. Location and installation requirements for hardware.
5. Thicknesses of materials, joints.
6. Connections and trim.

D. Samples: Two sets of color chips representing specified colors and finishes.

E. Verification Samples:
1. Submit samples of each type, consisting of aluminum door corner construction, minimum 6-inch by 6-inch (150 mm) legs.
2. Where color or texture variations are anticipated, such as anodized finishes, include two or more units in each set of samples indicating extreme limits of variations.

F. Hardware Templates: Provide finish hardware mounting details.

G. Manufacturer's Installation Instructions: Printed installation instructions for each product, including product storage requirements

H. Operations and Maintenance Data: Printed instructions for each product.

## 1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing aluminum door and frame systems of the type required for this project, with minimum ten continuous years documented experience.

B. Product Qualifications: Wind-load test certification conforming to ASTM E 330 on samples of previous products shall be provided for the type of door to be used.

C. Installer's Qualifications: Workmen skilled in handling aluminum door and frame systems of the type required for this project.

D. Instruction: The manufacturer or his representative will be available for consultation to all parties engaged in the project, including instruction to installation personnel.

### 1.6 DELIVERY, STORAGE AND HANDLING

A. Deliver doors and frames palleted, wrapped or individually crated. Doors shall be side protected with surrounding grooved 2-inch (50.8 mm) by 4-inch (101.6 mm) wood frame and covered with 275-pound (124.74 kg) test corrugated cardboard.

B. Inspect delivered doors and frames for damage; unload and store with minimum handling. Repair minor damage if refinished items are equal in all respects to new work; otherwise, remove damaged items and replace with new.

C. Store products of this section under cover in manufacturer's unopened packaging until installation.
1. Place units on minimum 4-inch (101.6 mm) wood blocking.
2. Avoid non-vented plastic or canvas covers.
3. Remove packaging immediately if packaging becomes wet.
4. Provide 0.25-inch (6.35 mm) air spaces between stacked doors.

### 1.7 PR**OJECT CONDITIONS**

A. Field Measurements: Take field measurements of areas to receive aluminum frames; note discrepancies on submitted shop drawings

### 1.8 SCHEDULING

A. Ensure that all approvals and/or shop drawings are supplied or returned to the manufacturer in time for fabrication without affecting construction progress schedule.

B. Ensure that templates and/or actual hardware requested by manufacturer are available in time for fabrication without affecting construction progress schedule

### 1.9 WARRANTY

A. Manufacturer**:** Ten year warranty against defects in workmanship and materials, including warping, rotting, decaying or bowing.
B. Installer**:** Warrant installation procedures and performance for five years against defects due to workmanship and materials handling.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Basis-of-Design Manufacturer: Cline Aluminum Doors, Inc.
112 – 32nd Avenue West, Bradenton, Florida 34205-8907
Telephone: (800) 648-6736, (941) 746-4104; Fax: (941) 746-5153
Website: www.clinedoors.com, Email: inquire@clinedoors.com

**Model: Series 100BE**

B. Or approved equal: Requests for substitution will be considered in accordance with provisions of Section 01 60 00.

## 2.2 COMPONENTS

A. **Aluminum Members:** Alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish.

B. **Aluminum Door Composite Components:** Minimum 5-ply composite laminated construction to include:
1. **Facing:** One-piece 0.040-inch (1.02 mm) smooth 5005-H14 stretcher-leveled aluminum alloy.
**Substrate:** One-piece oil-tempered hardboard backer.
2. **Core:** Organic materials shall be used to form a marine grade honeycomb core with high compression strength of 94.8 psi (ASTM C365), and internal aluminum hardware backup tube.
3. **Hardware Backup:** The hardware backup tube shall be a minimum 4.25- inches (107.95 mm) in width, 1.375-inches (34.93 mm) in depth with a wall thickness of 0.125-inches (3.18 mm). Contiguous for the full perimeter of the door to allow for all specified and non-specified hardware reinforcement.
4. **Hardware Prep:** Basic to include mortise lock edge prep or cylindrical lock prep; and pairs prepped for flush bolts, if required.
5. **Bonding Agent:** Environmentally friendly adhesive with strength buildup of 350 pounds per square inch (24.6 kg/cm$^2$).
6. **Perimeter Door Trim:** Wall thickness of 0.050-inch (1.25 mm) minimum in 6063-T5 extruded aluminum alloy with special beveled edge cap design and integral weather stripping on lock stile.
7. **Replaceable Door Trim:** Mechanically fastened to the hardware backup tube, allowing for replacement in the field, if damaged.
8. **Trim Finish:** To have minimum of a Class I anodized finish.
9. **Weather stripping:** Replaceable wool pile with nylon fabric, polypropylene backing meeting AAMA 701standards. Applied weather stripping not acceptable
10. **Materials:** Only nonferrous, non-rusting members shall be acceptable, including tie rods, screws and reinforcement plates.
11. **Regulations:** All components and agents to meet EPA standards.

C. **Door Louvers:**
1. **Blades and Frames:** 6063-T5 extruded aluminum alloy, 0.062-inch (1.57 mm) minimum thickness. Louver blades shall be inverted “Y” type.
2. **Insect Screens:** 14-18 mesh, 0.011-inch (0.28 mm) diameter alclad aluminum, set in 6063-T5 extruded aluminum alloy frame, 0.050-inch (1.25 mm) minimum thickness.
3. Louver shall have a minimum of 50-percent free airflow.

D. **Aluminum Frames:**
1. **Frame Components:** Extruded channel (tubular) 6063-T5 aluminum alloy, minimum wall thickness 0.125-inch (3.18 mm); cut corners square and joinery shall be mechanical with no exposed fasteners.
2. **Profile:** Open Back with Applied Stop (OBS), 1¾ inches by 5 inches (44 x 127 mm).
3. **Hinge and Strike Mounting Plates:** Extruded aluminum alloy bar stock, 0.1875-inch (4.75 mm) thick mounted in a concealed integral channel with no exposed fasteners.
4. **Replaceable Weather stripping:** AAMA 701, wool pile with nylon fabric, polypropylene

backing, at head and jambs.
5. **Door Stop:** No screw-on stops acceptable.
6. **Frame Finish:** Shall be anodized with Class II mechanical finish to match door finish

### 2.3 FINISH

A. Finish**:** High Performance Organic Coating: Kynar/Polyvinylidene Fluoride (PVDF) (AAMA 605.2).
1. Color: Selected by Architect from manufacturer's full range of available colors.

### 2.4 FABRICATION

A. General**:** Receive hardware if required by manufacturer.

B. Aluminum Door Construction: Of type, size and design indicated:
1. Minimum Thickness: 1.75-inches (44 mm), 5-ply composite laminate system.
2. Door Size: Sizes shown are nominal; provide standard clearances as follows:
   a. Hinge and Lock Stiles: 0.125-inch (3.18 mm).
   b. Between Meeting Stiles: 0.25-inch (6.35 mm).
   c. At Top Rails: 0.125-inch (3.18 mm).
   d. Between Door Bottom and Threshold: 0.125-inch (3.18 mm).

C. Aluminum Frames: Of shapes and contours indicted.
1. Corners shall be cut square.
2. Reinforce and secure mechanically.
3. No exposed fasteners.

### 2.5 ACCESSORIES

A. Fasteners**:** Aluminum, nonmagnetic stainless steel, or other material warranted by manufacturer as non-corrosive and compatible with aluminum components.
1. Do not use exposed fasteners.

B. Brackets and Reinforcements: Manufacturer's high-strength aluminum units where feasible, otherwise, nonferrous stainless steel.

C. Bituminous Coating: Cold-applied asphaltic mastic, compounded for 30-mil (0.76 mm) thickness per coat.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Verify that wall surfaces and openings are ready to receive frames and are within tolerances specified in manufacturer's instructions.

B. Verify that frames installed by other trades for installation of doors of this section are in strict accordance with recommendations and approved shop drawings and within tolerances specified in manufacturer's instructions

### 3.2 PREPARATION

A. Perform cutting, fitting, forming, drilling, and grinding of frames as required for project conditions; do not damage sight-exposed finishes.

B. Separate dissimilar metals to prevent electrolytic action between metals

## 3.3 INSTALLATION

C. Install doors and frames in accordance with manufacturer's instructions and approved shop drawings; set frames plumb, square, level, and aligned to receive doors.

D. Anchor frames to adjacent construction in strict accordance with recommendations and approved shop drawings and within tolerances specified in manufacturer's instructions.
   1. Seal metal-to-metal joints between framing members using good quality elastomeric sealant.

E. Where aluminum surfaces contact with metals other than stainless steel, zinc or small areas of white bronze, protect from direct contact by one or more of the following methods.
   2. Paint dissimilar metal with one coat of heavy-bodied bituminous paint.
   3. Apply good quality elastomeric sealant between aluminum and dissimilar metal.
   4. Paint dissimilar metal with one coat of primer and one coat of paint recommended for aluminum surface applications.
   5. Use non-absorptive tape or gasket in permanently dry locations.

F. Hang doors with required clearances as follows:
   6. Hinge and Lock Stiles: 0.125 inch (3.18 mm).
   7. Between Meeting Stiles: 0.250 inch (6.35 m).
   8. At Top Rails: 0.125 inch (3.18 mm).
   9. Between Door Bottom and Threshold: 0.125 inch (3.18 mm).

G. Adjust doors and hardware to operate properly.

H. Install hardware for doors of this section.

I. Installation of door hardware is specified in Section 08 71 00.

## 3.4 CLEANING

A. Upon completion of installation, thoroughly clean door and frame surfaces in accordance with AAMA 609.
B. Do not use abrasive, caustic or acid cleaning agents

## 3.5 PROTECTION

A. Protect products of this section from damage caused by subsequent construction until substantial completion.

B. Repair damaged or defective products to original specified condition in accordance with manufacturer's recommendations.

C. Replace damaged or defective products that cannot be repaired to Architect's acceptance.

**END OF SECTION**

**SECTION 08 71 00**

**DOOR HARDWARE**

## PART 1 GENERAL

### 1.1 SUMMARY

A. SECTION INCLUDES
   1. Hardware for hollow steel doors & aluminum flush doors.
   2. Hardware for non-rated & fire-rated doors.
   3. Electrically operated & controlled hardware.
   4. Lock cylinders for doors for which hardware is specified in other sections.
   5. Thresholds.
   6. Weather-stripping, seals & door gaskets.

B. RELATED REQUIREMENTS
   1. Section 08 11 13 - Hollow Metal Doors and Frames.

### 1.2 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; current edition; (ADA Standards for Accessible Design).

B. BHMA A156.1 - American National Standard for Butts and Hinges; Builders Hardware Manufacturers Association, Inc.; 2006 (ANSI/BHMA A156.1).

C. BHMA A156.3 - American National Standard for Exit Devices; Builders Hardware Manufacturers Association; 2008 (ANSI/BHMA A156.3).

D. BHMA A156.4 - American National Standard for Door Controls - Closers; Builders Hardware Manufacturers Association, Inc.; 2008 (ANSI/BHMA A156.4).

E. BHMA A156.7 - American National Standard for Template Hinge Dimensions; Builders Hardware Manufacturers Association; 2003 (ANSI/BHMA A156.7).

F. BHMA A156.13 - American National Standard for Mortise Locks & Latches; Builders Hardware Manufacturers Association; 2005 (ANSI/BHMA A156.13).

G. BHMA A156.17 - American National Standard for Self-Closing Hinges & Pivots; Builders Hardware Manufacturers Association, Inc.; 2004 (ANSI/BHMA A156.17).

H. BHMA A156.18 - American National Standard for Materials and Finishes; Builders Hardware Manufacturers Association, Inc.; 2006 (ANSI/BHMA A156.18).

I. BHMA A156.21 - American National Standard for Thresholds; Builders Hardware Manufacturers Association; 2009 (ANSI/BHMA A156.21).

J. BHMA A156.22 - American National Standard for Door Gasketing and Edge Seal Systems, Builders Hardware Manufacturers Association; 2012 (ANSI/BHMA A156.22).

K. BHMA A156.23 - American National Standard for Electromagnetic Locks; Builders Hardware Manufacturers Association, Inc.; 2010 (ANSI/BHMA A156.23).

L. BHMA A156.24 - American National Standard for Delayed Egress Locks; Builders Hardware Manufacturers Association; 2003 (ANSI/BHMA A156.24).

M. BHMA A156.31 - Electric Strikes and Frame Mounted Actuators; 2007 (ANSI/BHMA A156.31).

N. BHMA A156.115 - Hardware Preparation in Steel Doors and Steel Frames; 2006.
O. BHMA A156.115W - Hardware Preparation in Wood Doors with Wood or Steel Frames; 2006.
P. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.
Q. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2013.
R. NFPA 101 - Code for Safety to Life from Fire in Buildings and Structures; National Fire Protection Association; 2012.
S. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

## 1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the manufacture, fabrication, and installation of products onto which door hardware will be installed.
B. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
C. Convey Owner's keying requirements to manufacturers.
D. Pre-installation Meeting: Convene a pre-installation meeting one week prior to commencing work of this section; require attendance by all affected installers.

## 1.4 SUBMITTALS

A. See Section 01 33 00 for submittal procedures.
B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project.
C. Hardware Schedule: Detailed listing of each item of hardware to be installed on each door. Use door numbering scheme as included in the Contract Documents. Identify electrically operated items and include power requirements.
D. Keying Schedule: Submit for approval of Owner.
E. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
F. Keys: Deliver with identifying tags to Owner by security shipment direct from hardware supplier.
G. Warranty: Submit manufacturer's warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
H. LEED Submittals: For all spaces where hazardous gases or chemicals may be present or used (i.e. janitor rooms, housekeeping and laundry areas, etc.), provide submittal or product data sheet for self-closing door hardware used for doors to the spaces.

## 1.5 QUALITY ASSURANCE

A. Hardware Supplier Qualifications: Company specializing in supplying commercial door hardware with ten years of experience.
B. Hardware Supplier Personnel: The supplier to be a directly franchised distributor of the products to be furnished and have in their employ an AHC (Architectural Hardware Consultant). This person is to be available for consultation to the architect, owner and the general contractor at reasonable times during the course of work.

C. The finish hardware supplier shall prepare and submit to the Architect two (2) hard copies of a complete schedule identifying each door and each set number, following the numbering system and not creating any separate system himself. He shall submit the schedule for review, make corrections as directed and resubmit the corrected schedule for final approval. Approval of schedule will not relieve Contractor of the responsibility for furnishing all necessary hardware, including the responsibility for furnishing correct quantities.

D. No manufacturing orders shall be placed until detailed schedule has been submitted to the architect and written approval received.

E. After hardware schedule has been approved, furnish templates required by manufacturing contractors for making proper provisions in their work for accurate fitting, finishing hardware setting. Furnish templates in ample time to facilitate progress of work.

F. Hardware supplier shall have an office and warehouse facilities to accommodate the materials used on this project. The supplier must be an authorized distributor of the products specified.

G. The hardware manufactures are to supply both a pre-installation class as well as a post-installation walk-thru. This is to insure proper installation and provide for any adjustments or replacements of hardware as required.

### 1.6 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match hardware schedule.

### 1.7 WARRANTY

A. See Section 01 77 00 - Closeout Procedures, for additional warranty requirements.

B. The manufacturer against failure due to defective materials and workmanship shall warrant overhead door closers in writing for a period of ten (10) years. Commencing on the Date of Final Completion and Acceptance, and in the event of failure, the manufacture is to promptly repair or replace the defective with no additional cost to the Owner.

## PART 2 PRODUCTS

### 2.1 DOOR HARDWARE – GENERAL

A. Provide all hardware specified or required to make doors fully functional, compliant with applicable codes, and secure to the extent indicated.

B. Provide all items of a single type of the same model by the same manufacturer.

C. Provide products that comply with the following:
   1. ADA Standards for Accessible Design.
   2. Applicable provisions of NFPA 101, Life Safety Code.
   3. Fire-Rated Doors: NFPA80.
   4. All Hardware on Fire-Rated Doors: Listed and classified by UL as suitable for the purpose specified and indicated.
   5. Hardware for Smoke and Draft Control Doors: Provide hardware that enables door assembly to comply with air leakage requirements of the applicable code.

6. Products Requiring Electrical Connection: Listed and classified by UL as suitable for the purpose specified and indicated.
7. Hardware for spaces where hazardous gases or chemicals may be present or used (i.e. janitor rooms, housekeeping and laundry areas, etc.): Provide hardware that enables door(s) to be self-closing.

D. Function: Lock and latch function numbers and descriptions of manufactures series as listed in hardware schedule.

E. Electrically Operated and/or Controlled Hardware: Provide all power supplies, power transfer hinges, relays, and interfaces required for proper operation; provide wiring between hardware and control components and to building power connection.

F. All numbers and symbols used herein have been taken from the current catalogues of the following manufacturers. Requests for substitution will be considered in accordance with provisions of Section 01 60 00:

| PRODUCT | ACCEPTABLE MANUFACTURER | ACCEPTABLE SUBSTITUTE |
|---|---|---|
| 1) Hinges | Ives | Hager, Stanley, Bommer |
| 2) Locks & Latches | Schlage | As Selected and Approved |
| 3) Electronic Locksets | Schlage | As Selected and Approved |
| 4) Door Closers | LCN | As Selected and Approved |
| 5) Exit Devices | Falcon | As Selected and Approved |
| 6) Over Head Stop/Holder | Glynn Johnson | Rixson |
| 7) Wall Stops/Floor Stops, Flush bolts | Ives | Burns, Rockwood, |
| 8) Threshold/Weather-strip | Zero | National Guard, Pemko |
| 9) Silencers | Ives | Trimco, Rockwood |
| 10) Key Cabinet | Lund | Key Control |

G. If material manufactured by other than that specified or listed herewith as an equal, is to be bid upon, permission must be requested from the architect seven (7) days prior to bidding. If substitution is allowed, it will be so noted by addendum.
H. Hinges to be stainless (630), Locks to be stainless (630), Flat Goods to be Stainless Steel (630) and the Thresholds to be stainless (630).
I. Butts shall be Stainless Steel. Butts on all out exterior and security out- swinging doors shall be furnished with non-removable pins (NRP).
J. Interior butts shall be as listed.
K. Doors 5’ or less in height shall have two (2) butts. Furnish one (1) additional butt for each 2’6” in height or fraction thereof. Dutch door shall have two (2) butts per leaf.
L. Equip locks and cylinders with 6 pin key.
M. All bittings shall be issued by lock manufacture per owners instructions.
N. Provide Four (4) each change keys per lock and Six (6) each grand master, master keys, extractor and control keys and (10) each construction keys.
O. Hardware supplier to provide Construction keyed cores or cylinders as required. The contractor is to change out the construction keyed cores at owner’s direction.
P. Key to existing or new key system as directed by owner.
Q. 50 Extra Key blanks for Owner.
R. Locksets shall be Schlage L Series and ND Series, unless specified otherwise, with Lever designs as scheduled.
S. Exit devices shall be tested to ANSI/BHMA A156.3 test requirements by a BHMA certified testing laboratory.
T. Exit devices shall have Miami-Dade Building Code approval as scheduled.
U. Kick plates, mop plates, and armor plates, shall be .050 gauge with stainless (630) finish. Kick

plates to be 10” high, mop plates to be 4” high. All plates shall be two (2) inches less full width of a single door. One (1) inches on a pair of doors.

V. Push plates, pull plates, door pulls, and miscellaneous door trim shall be shown in the hardware schedule.

W. Doorstops shall be furnished for all doors to prevent damage to doors or hardware from striking adjacent walls or fixtures. Wall bumpers equal to Ives WS407 Series are preferred, but where not practical furnish floor stops equal to Ives FS436 or FS438 series. Where conditions prohibit the use of either wall or floor type stops, furnish surface mounted overhead stops equal to Glynn Johnson, 450 Series.

X. Thresholds and weather-strip shall be as listed in the hardware schedule.

Y. Gasket shall be UL10C Positive Pressure listed.

Z. Furnish rubber door silencers equal to Ives SR64 for all new interior hollow metal frames, (2) per pair and (3) per single door frame.

## PART 3 EXECUTION

### 3.1 EXAMINATION

A. Verify that doors and frames are ready to receive work; labeled, fire-rated doors and frames are present and properly installed, and dimensions are as indicated on shop drawings.

B. Verify that electric power is available to power operated devices and of the correct characteristics.

### 3.2 INSTALLATION

A. Install hardware in accordance with manufacturer's instructions and applicable codes.

B. Use templates provided by hardware item manufacturer.

C. Do not install surface mounted items until finishes applied to substrate are complete.

D. Install hardware on fire-rated doors and frames in accordance with code and NFPA 80.

E. Mounting heights for hardware from finished floor to center line of hardware item: As listed in Schedule, unless otherwise noted.

F. All hardware shall be applied and installed in accordance with the Finish Hardware schedule. Care shall be exercised not to mar or damage adjacent work.

G. Contractor to provide a secure lock-up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items that are not immediately replaceable, so that the completion of the work will not be delayed by hardware losses both before and after installation.

H. Set up and index one (1) Key Cabinet that allows room for expansion for 150% of the number of keys for the project.

### 3.3 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Section 01 4000.

B. Provide an Architectural Hardware Consultant to inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions and as specified.

### 3.4 ADJUSTING

A. Adjust work under provisions of Section 01 70 00.
B. Adjust hardware for smooth operation.
C. Adjust gasketing for complete, continuous seal; replace if unable to make complete seal.

### 3.5 CLEANING

A. Clean adjacent surfaces soiled by hardware installation. Clean finished hardware per manufacturer's instructions after final adjustments has been made. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

### 3.6 PROTECTION

A. Protect finished Work under provisions of Section 01 70 00.
B. Do not permit adjacent work to damage hardware or finish.

## PART 4 HARDWARE GROUPS

### 4.1 HARDWARE SCHEDULE:

A. The following schedule is furnished for whatever assistance it may afford the contractor; do not consider it as entirely inclusive. Should any particular door or item be omitted in any scheduled hardware group, provide door or item with hardware same as required for similar purposes. Quantities listed are for each pair of doors or for each single door.
B. This hardware schedule was prepared by:

Allegion, PLC
3451 Technological Ave, Suite 7
Orlando, FL 32817
Ph: 407-571-2000
Fax 407-571-2006

MANUFACTURER INDEX:

FAL = Falcon
GLY = Glynn-Johnson
LCN = LCN Closers
IVE = Ives
SCE = Schlage Electronics
SCH = Schlage
ZER = Zero
LDW = Less Door Width
LAR = Length as Required

*Hardware Groups 1-9, 12-15, & 17-23 omitted.*

**Hardware Group No. 10**

Provide each SGL door(s) with the following:

| Qty | | Description | Catalog Number | Finish | Mfr |
|---|---|---|---|---|---|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 630 | IVE |
| 1 | EA | CLASSROOM SEC W/DB | L9457P 06A | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 4050 AS REQ | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW B-CS | 630 | IVE |
| 1 | EA | FLOOR STOP | FS436 | 626 | IVE |
| 1 | EA | GASKETING | 328AA | AA | ZER |
| 1 | EA | THRESHOLD | 65A-MSLA-10 | A | ZER |

IN-SWING HURRICANE NOA 15-0427.04

Operational Description
Latchbolt retracted by knob/lever from either side. Deadbolt thrown or retracted by key from either side. Throwing deadbolt locks outside knob/lever. Turning inside knob/lever simultaneously retracts deadbolt and latch bolt and unlocks outside knob/lever. Inside lever is always free for immediate egress.
Self-Closing.

**Hardware Group No. 11**

Provide each SGL door(s) with the following:

| Qty | | Description | Catalog Number | Finish | Mfr |
|---|---|---|---|---|---|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 630 | IVE |
| 1 | EA | STOREROOM W/DEADBOLT | L9480P 06A | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 4050 AS REQ | 689 | LCN |
| 1 | EA | KICK PLATE | 8400 10" X 2" LDW B-CS | 630 | IVE |
| 1 | EA | FLOOR STOP | FS436 | 626 | IVE |
| 1 | EA | GASKETING | 328AA | AA | ZER |
| 1 | EA | THRESHOLD | 65A-MSLA-10 | A | ZER |

IN-SWING HURRICANE NOA 15-0427.04

Operational Description
Latchbolt retracted by key outside or by lever or knob inside. Outside knob/lever always fixed. Deadbolt thrown or retracted by key outside or thumb turn inside. Turning inside knob/lever simultaneously retracts both deadbolt and latch bolt. Auxiliary latch deadlocks latch bolt when door is locked. Inside lever is always free for immediate egress.
Self-Closing.

**Hardware Group No. 16**

Provide each SGL door(s) with the following:

| Qty | | Description | Catalog Number | Finish | Mfr |
|---|---|---|---|---|---|
| 3 | EA | HINGE | 5BB1 4.5 X 4.5 | 652 | IVE |
| 1 | EA | VANDL STOREROOM LOCK | ND96PD RHO | 626 | SCH |
| 1 | EA | SURFACE CLOSER | 1450 AS REQ | 689 | LCN |
| 1 | EA | FLOOR STOP | FS436 | 626 | IVE |
| 1 | EA | WALL STOP | WS406/407CVX | 630 | IVE |
| 1 | EA | GASKETING | 188S-BK | S-Bk | ZER |

Vandlgard lever. Outside lever always disengaged. Entrance by key only. Inside lever always unlocked. Self-Closing.

**Hardware Group No. 24**

Provide each PR door(s) with the following:

| Qty | | Description | Catalog Number | Finish | Mfr |
|---|---|---|---|---|---|
| 6 | EA | HINGE | 5BB1 4.5 X 4.5 NRP | 630 | IVE |
| 2 | EA | SURFACE BOLT | SB360 12" T | 604 | IVE |
| 1 | EA | VANDL STOREROOM LOCK | ND96PD RHO 14-042 | 626 | SCH |
| 2 | EA | SURFACE CLOSER | 4050 SCUSH | 689 | LCN |
| 1 | EA | GASKETING | 328AA | AA | ZER |
| 1 | EA | ASTRAGAL | Z BY MFG | | |
| 1 | EA | THRESHOLD | 65A-MSLA-10 | A | ZER |

Operational Description
Vandlgard lever. Outside lever always disengaged. Entrance by key only. Inside lever always unlocked. Self-Closing. Templating allows Spring CUSH Arm to stop the door's swing between 85 and 110 degrees.

**END OF SECTION**

# SECTION 08 91 00

# PERFORMANCE LOUVERS

## PART 1 – GENERAL

### 1.1 SECTION INCLUDES:

A. AMCA540/550, extreme performance water, air, and wind driven rain listed louver.

### 1.2 RELATED SECTIONS

A. Section 03 30 00 – Cast-In-Place Concrete
B. Section 04 20 00 – Masonry Units.
C. Section 07 42 00 – Metal Wall Panels
D. Section 07 60 00 – Flashing and Sheet Metal
E. Section 07 92 00 – Joint Sealants
F. Section 09 91 00 – Paints
G. Section 23 37 00 – Air Outlets and Inlets
H. Section 23 33 13 – Dampers
I. Section 23 09 13 – Instrumentation and Control Devices for HVAC.

### 1.3 REFERENCES

A. AAMA 2604 – High performance organic coatings on architectural extrusions and panels.
B. AAMA 2605 – High performance organic coatings on architectural extrusions and panels.
C. AAMA 611 – Voluntary specification for anodized architectural aluminum
D. AMCA 500L – Test methods for louvers, dampers and shutters.
E. AMCA 511 – Certified ratings program for air control devices.
F. AMCA 540 – Test method for louvers impacted by windborne debris – enhanced protection.
G. AMCA 550 – High velocity wind driven rain resistant louvers.
H. ASCE 7 – Minimum design loads for buildings and other structures.
I. ASTM D822 – Standard practice for filtered open-flame-carbon-arc exposures of paint and related coatings.
J. ASTM D4214 – Standard test methods for evaluating the degree of chalking of exterior paint films.
K. ASTM D2244 – Standard test method for calculation of color differences from instrumentally measured color coordinates.

### 1.4 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this section unless otherwise defined in this Section or in reference standards.
B. Horizontal Louver: Louver with horizontal blades; i.e., the axes of the blades are

horizontal.

C. Vertical Louver: Louver with vertical blades; i.e., the axes of the blades are vertical.

D. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.

E. Rain-Resistant Louver: Louver that provides specified wind-driven rain performance, as determined by testing according to AMCA 500-L.

## 1.5 ACTION SUBMITTALS

A. Submit under provisions of section 01 33 00.

B. Product Data: For each product to be used, including:
   1. Manufacturer's product data including performance data.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Installation methods.

C. Shop Drawings:
   1. Submit shop drawings indicating materials, construction, dimensions, accessories, and installation details.

D. Product Schedule: For louvers. Use same designations indicated on Drawings.

E. Samples: Submit sample of louver to show frame, blades, bird screen, gutters, downspouts, vertical supports, sill, accessories, finish, and color.

## 1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer and installer.

B. Product Test Reports: For each type of louver, for tests performed by a qualified testing agency.

C. Field quality-control reports.

D. Sample Warranties: for manufacturer's warranties.

## 1.7 QUALITY ASSURANCE

A. Manufacturer's Qualifications:
   1. The manufacturer shall have implemented the management of quality objectives, continual improvement, and monitoring of customer satisfaction to assure that customer needs and exceptions are met.
   2. Manufacturer shall be International Organization for Standardization (ISO) 9001:2-15 accredited.

B. Product Qualifications:

1. Louvers licensed to bear AMCA Certified Ratings Seal. Ratings based on tests and procedures performed in accordance with AMCA 511 and comply with AMCA Certified Ratings Program. AMCA Certified Rating Seal applies to air performance and water penetration ratings.
2. Louvers shall be factory engineered to withstand the specific seismic loads.
   a. Minimum design loads shall be calculated to comply with ASCE – 7, or local requirements of Authority Having Jurisdiction (AHJ).
3. Recycled Content: Provide louver that incorporated recycled content materials. The louver shall consist of the following recycled content:
   a. Fabricated aluminum recycled content 75% by weight. 10% post-consumer, 15% pre-consumer.

## 1.8 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store materials in a dry area indoors, protected from damage and in accordance with manufacturer's instructions.

C. Handling: Protect materials and finishes during handling and installation to prevent damage.

D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

## 1.9 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer's for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

## 1.10 WARRANTY

A. Manufacturer shall provide standard limited warranty for louver systems for a period of five (5) years (60 months) from date of installation, no more than 60 months after shipment from manufacturing plant. When notified in writing from the Owner of a manufacturing defect, manufacturer shall promptly correct deficiencies without cost to the Owner.

B. Manufacturer shall provide 20-year limited warranty for fluoropolymer-based finish on extruded aluminum substrates.
   1. Finish coating shall not peel, blister, chip, crack or check.
   2. Chalking, fading or erosion of finish when measured by the following tests:
      a. Finish coating shall not chalk in excess of 8 numerical ratings when measured in accordance with ASTM D4214.
      b. Finish coating shall not change color or fade in excess of 5 NBS units as determined by ASTM D2244 and ASTM D822.
      c. Finish coating shall not erode at a rate of excess of 10%/5 years as determined by Florida test sample.

C. Manufacturer shall provide a 5-year limited warranty for Class 1 and Class 2 anodized finish on extruded aluminum substrates.
   1. Seller warrants the finish under normal atmospheric conditions.
      a. Will not crack, craze, flake or blister.
      b. Will not change or fade more than (5) Delta-E Hunter units as determined by ASTM method D-2244.
      c. Will not chalk in excess of ASTM D-4214-07 number (8) rating, determined by the procedure outlined in ASTMD-4214-07 specification test.
   2. Any forming or welding must be done prior to finishing. Post forming or welding will void the warranty.

   3. This warranty applies only if the anodized aluminum product is installed in struct accordance with Seller's recommended practices and maintained in accordance with AAMA (American Architectural Manufacturers Association) Publication number 609 and 610-09 (Cleaning and maintenance guild for architecturally finished (Cleaning and maintenance guile for Architecturally finished.
   4. PVDF Finish: Twenty years.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS:

A. Acceptable Manufacturer; Ruskin Company; 3900 Dr. Greaves Road, Kansas City, MO 64030. Tel: (816) 761-7476 or equal.

   1. Wire Conductors: Color coded, 14 gauge minimum.

### 2.2 EXTREME PERFORMANCE BLADE LOUVER

A. Model: HZ700 as manufactured by Ruskin Company

B. Description:
   1. Design: Extruded aluminum, wind driven rain resistant, double frame, two-piece blade design with a horizontal front and vertical rear, extreme performance louver.
   2. Application: The HZ700 is a double frame extreme performance louver. Its two-piece blade design provides protection from wind-driven rain penetration, reducing damage and additional operating expenses. The HZ700 has visible mullion construction featuring horizontal front blade design for architecturally pleasing aesthetics.
   3. Frame:
      a. Frame Depth: Front Frame: 4 inches (102 mm), nominal
         Rear Frame: 3 inches (76 mm), nominal
      b. Wall Thickness: 0.080 inch (2.0 mm), nominal
      c. Material: Extruded aluminum, Alloy 6063-T6
   4. Blades:
      a. Style: Horizontal front blade on a 3.8" (96.52) center to center spacing and vertical rear blade on a ¾" (1.9) center to center spacing.

b. Wall Thickness: Front blade 0.080 inch (2.0 mm), nominal. Rear blade .050" (1.3).
c. Material: Extruded aluminum, Alloy 663-T6.

5. Aluminum, 5/8 inches by 0.040 (16 mm by 1 mm), expanded and flattened.
6. Recycled Content: 18% post-consumer. 55% pre-consumer, post-industrial, total 73% by weight.

C. Performance Data:
1. AMCA Listing Label Compliance:
a. AMCA 540 – Test method for louvers impacted by windborne debris.
1. Missile E-Enhanced Protection.
b. Cycle tested per MACA 540
c. AMCA 550 – High velocity wind driven rain
2. AMCA Certified Ratings Program
a. Based on testing 48 inches x 48 inches (1,219 mm x 1,219 mm) size unit in accordance with AMCA 500.
b. Free Area: 53% nominal. Free Area Size: 8.49 square feet (0.79 m squared).
c. Water penetration: Maximum of 0.01 ounce per square foot (3.1 g/m) of free area at an air flow rate of 803 fpm (4.08 m/s) free area velocity when tested for 15 minutes.
d. Pressure Drop: Maximum Intake Pressure Drop at 1,000 fpm: 0.31 inches w.g. (0.08 kPa).
e. Wind Driven Rain: Minimum wind-driven rain performance based on testing 39.375 inches x 39.375 inches (1 m x 1 m) core area, 41.375 inches x 44.2 inches (1.04 m x 1.12 m) nominal size unit in accordance with AMCA 500-L.
1. Wind Velocity: 29 mph (47 kph) & Rainfall Rate: 8 inches/hour (203 mm.hour).
a) Water resistance effectiveness: 99.8% (AMCA Class A)
b) Free Area Velocity: 1562 feet per minute (7.9 m/s)
2. Wind Velocity: 50 mph (80 kph) & rainfall Rate: 8 inches/hour (203 mm.hour).
a) Water Resistance Effectiveness: 99.8% (AMCA Class A).
b) Free Area Velocity: 1558 feet per minute (7.9 m/s).

D. Design Wind load: Incorporate structural supports required to withstand wind load of +-130 PSF (6.7 kPa).

E. Louvers shall be factory engineered to withstand the specified seismic loads.
1. Minimum design loads shall be calculated to comply with ASCE-7, or local requirements of Authority Having Jurisdiction (AHJ).
2. Seismic Performance: Louvers, including attachments to other construction, shall withstand seismic effects determined by ASCE-7.

## 2.3 ACCESSORIES

A. Aluminum Blank-Off Panels: 0.040 (1 mm) aluminum sheet, factory installed with removeable fasteners and neoprene gaskets.

B. Insulated Aluminum Blank-Off Panels: 0.040 (1 mm) aluminum sheet, 1-inch (25 mm)

aluminum skin insulated core, factory installed with removeable fasteners and neoprene gaskets.

C. Insulated Aluminum Blank-Off Panels: 0.040 (1 mm) aluminum sheet, 2-inch (51 mm) aluminum skin insulated core, factory installed with removeable fasteners and neoprene gaskets.

D. Aluminum Filter Racks: formed channel racks to accept standard thick filters. Unused bottom portion blanked off with 0.040-inch (1 mm) aluminum sheet.
   1. Filter: 1 inch (25 mm) thick
   2. Filter: 2 inch (51 mm) thick.

E. Security Bars:
   1. Location: Front
   2. Location: Rear
   3. Construction: Aluminum ¾ inch x ½ inch (19 mm x 13 mm), welded to louver.
   4. Construction: Aluminum, ¾ inch x ½ inch 19 mm x 13 mm), welded to louver.

F. Sleeve:
   1. Aluminum: Aluminum sheet 0.125” thk, 4 side continuous welded.

G. Bird Screen:
   1. Aluminum: Aluminum, 5/8 inches by 0.040 inch (16 mm by 1 mm), expanded and flattened.
   2. Aluminum: Aluminum, ½ inch mesh x 0.063 inch (13 mm mesh x 1.6 mm), inter crimp.
   3. Frame: Removable.

H. Insect Screens:
   1. Aluminum: 18-16 mesh, mil finish, 0.11 inch (0.3 mm) wire.
   2. Frame: Aluminum

I. Extended Sills:
   1. Extruded Aluminum, Alloy 6063-T6. Minimum nominal thickness 0.060 inch (1.5 mm).
   2. Formed Aluminum: Alloy 3003. Minimum nominal thickness 0.081 inch (2.1 mm).

## 2.4 FINISHES

A. Finish: 70% PVDF: Finish shall be applied at 1.2 mil total dry film thickness,
   1. Coating shall conform to AAMA 2605. Apply coating following cleaning and pretreatment. Cleaning: AA-C12C42R1X.
      a. Standard 2-coat
      b. Pearledize 70 (2-coat mica)
      c. 3-coat metallic
      d. 3-coat exotic
   2. 20-year finish warranty.

B. Color to match-as selected by Architect from manufacturer's full range.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Inspect areas to receive louvers. Notify the Architect of conditions that would adversely affect the installation or subsequent utilization of the louvers. Do not proceed with installation until unsatisfactory conditions are corrected.

B. If opening preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### 3.2 PREPARATION

A. Clean opening thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best results for the substrate under the project condition.

### 3.3 INSTALLATION

A. Install louvers at locations indicated on the drawings and in accordance with manufacturer's instructions.

B. Install louvers, plumb, level, in plane of wall, and in alignment with adjacent work.

C. The supporting structure shall be designed to accommodate the point loads transferred by the louvers when subject to the design wind loads.

1. Louvers shall be secured to a structural substrate in accordance with Dade County Product Approval Drawings.

D. Install joint sealants as specified in Section 07 92 00.

E. Apply field topcoat within 6 months of application of shop prime coat.

### 3.4 CLEANING

A. Clean louver surfaces in accordance with manufacturer's instructions.

B. Touch up, repair or replace damaged products before substantial completion.

**END OF SECTION**

# SECTION 09 90 00
# PAINTS & COATINGS FOR METAL

## PART 1 - GENERAL

### 1.1 SUMMARY

A. SECTION INCLUDES
   1. Exterior Paint Systems: Surface preparation and field painting of exposed exterior items and surfaces.
   2. Exterior High Performance Coating Systems: Surface preparation and field application of exterior high-performance coating systems to items and surfaces scheduled.

B. RELATED SECTIONS
   1. Division 03 Section “Cast-in-Place Concrete”
   2. Division 05 Section “Architecturally-Exposed Structural Steel Framing”
   3. Division 05 Section “Metal Fabrications”
   4. Division 08 Section “Metal Doors and Frames”
   5. Division 09 Section “Gypsum Board Area Separation Wall Assemblies”
   6. Division 22 Section “Common Work Results for Plumbing”
   7. Division 26 Section “Common Work Results for Electrical”

### 1.2 REFERENCES

A. American Society for Testing and Materials (ASTM) D 16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.

B. Steel Structures Painting Council (SSPC) SP6 - Commercial Blast Cleaning Procedures.

C. Steel Structures Painting Council (SSPC) SP10 - Near White Blast Cleaning Procedure.

### 1.3 DEFINITIONS

A. General: Standard coating terms in accordance with ASTM D523.
   1. Gloss Level 1 (Flat): Not more than 5 units at 60 degrees and 10 units at 85 degrees, in accordance with ASTM D523.
   2. Gloss Level 2 (Low Sheen): Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, in accordance with ASTM D523.
   3. Gloss Level 3 (Eggshell): 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, in accordance with ASTM D523.
   4. Gloss Level 4 (Satin): 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, in accordance with ASTM D523.
   5. Gloss Level 5 (Semi-Gloss): 35 to 70 units at 60 degrees, in accordance with ASTM D523.
   6. Gloss Level 6 (Gloss): 70 to 85 units at 60 degrees, in accordance with ASTM D523.
   7. Gloss Level 7 (High-Gloss): More than 85 units at 60 degrees, in accordance with ASTM D523.

B. Environments: The following terms distinguish between different corrosive exposures:
   1. Severe Environments: Highly corrosive industrial atmospheres. Sustained exposure to high humidity and condensation and with frequent cleaning using

strong chemicals. Environments with heavy concentrations of strong chemical fumes and frequent splashing and spilling of harsh chemical products are severe environments.

2. Moderate Environments: Corrosive industrial atmospheres with intermittent exposure to high humidity and condensation, occasional mold and mildew development, and regular cleaning with strong chemicals. Environments with exposure to heavy concentrations of chemical fumes and occasional splashing and spilling of chemical products are moderate environments.
3. Mild Environment: industrial atmospheres with normal exposure to moderate humidity and condensation, occasional mold and mildew development, and infrequent cleaning with strong chemicals. Environments with low levels of mild chemical fumes and occasional splashing and spilling of chemical products are mild environments. Normal outdoor weathering is also considered a mild environment.

## 1.4 SUBMITTALS

A. Submit under provisions of Section 01 33 00 – Submittal Procedures.

B. Product Data: For each paint system indicated, including:
1. Material List: An inclusive list of required coating materials. Indicate each material and cross reference specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
2. Preparation instructions and recommendations.
3. Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.

C. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

D. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.

## 1.5 QUALITY ASSURANCE

A. Installer Qualifications: A firm or individual with minimum five (5) year’s experience in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

C. Paint exposed surfaces. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select from standard colors and finishes available.

D. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

E. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
1. Finish areas designated by Architect.
2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.

3. Refinish mock-up area as required to produce acceptable work.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label:

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45°F (7°C). Maintain storage containers in a clean condition, free of foreign materials and residue.

## 1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Apply waterborne paints only when temperatures of surfaces to be painted and surrounding air are between 50 and 90°F (10 and 32°C).

C. Apply solvent-thinned paints only when temperatures of surfaces to be painted and surrounding air are between 45 and 95°F (7 and 35°C).

D. Do not apply paint in snow, rain, fog, or mist: or when relative humidity exceeds 85 percent: or at temperatures less than 5°F (3°C) above the dew point: or to damp or wet surfaces.
   1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.

## 1.8 WARRANTY

A. Warrant product, when applied in the manner described within this section to a properly prepared and primed substrate and when properly cured and exposed under normal atmospheric conditions.

B. Exposed Coating: Deterioration includes but is not limited to:
   1. Color fading in excess of 5 Delta E Hunter units per ASTM D 2244-85 measured on the exposed painted surfaces which have been cleaned of eternal deposits and chalk.
   2. Any loss of adhesion as evidenced by chipping, cracking or peeling.
   3. Chalking in excess of a No. 8 as measured using the procedures of ASTM D 4214-89, when tested per Method D 659.
   4. Corrosion of substrate in excess of a No. 6 on cut edges and a No. 8 on field surfaces, when measured per ASTM D 1654.

C. Warranty Period: 15 years from date of substantial completion.

## 1.9 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

B. Quantity: Furnish Owner with an additional three percent, but not less than 1 gal (3.8 l) or 1

case, as appropriate, of each material and color applied.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Basis-of-Design Product: Provide coatings manufactured by PPG, Pittsburgh PA; tel: 800-258-6398, website: ppgmetalcoatings.com or comparable products of another manufacturer approved by Architect prior to bid.

1. Basis of Design: PPG Paints as manufactured and supplied by PPG.

B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

### 2.2 PAINT MATERIALS GENERAL

A. Material Compatibility: Provide block fillers, primers, and finish-coat materials that are compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. VOC Classification: Provide high-performance coating materials, including primers, undercoats, and finish-coat materials, that meet the applicable local, state or federal VOC requirements.

C. Color: Refer to Finish Schedule and Paint Legend for paint colors.

### 2.3 EXTERIOR HIGH PERFORMANCE COATING SYSTEMS

A. Fluoropolymer System, Ferrous Metal and Steel.

1. Primer: PPG Coraflon™ ADS Organic Zinc ADS 570 ABZ; 3.0-4.0 mils dft. (Not Compliant in SCAQMD.)
2. Intermediate: PPG Coraflon ADS 573 Series Coraflon ADS Epoxy Intermediate Primer; 3.0-5.0 mils dft. (Not Compliant in SCAQMD.)
3. Finish: PPG Coraflon ADS; 1.5-2.3 mils dft. (Not Compliant in SCAQMD.) Apply per instructions on the technical data bulletin. Metallic finishes may require an additional clear coat of Coraflon ADS.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.
2. If a potential incompatibility of primers applied by others exists, obtain the following

from the primer Applicator before proceeding:
a. Confirmation of primer's suitability for expected service conditions.
b. Confirmation of primer's ability to be top coated with materials specified.

D. Work under this section shall also include, but not necessarily be limited to:
1. Surface Preparation: Prepare surface per SSPC SP-6 “commercial blast” minimum. Surface profile shall be 2.0 – 2.5 mils.
2. Primer Application: Apply one coat of primer (Coraflon™ ADS Organic Zinc ADS 570 ABZ; 3.0-4.0 mils dft.) Refer to the technical data bulletin for complete product and application information.
3. Intermediate Coat: Apply one coat of intermediate (Coraflon™ ADS Epoxy Primer/Intermediate ADS573/ADS574; 3.0-5.0 mils dft.) Refer to the technical data bulletin for complete product and application information.
4. Finish Coat Application.
a. Apply one coat of finish (Coraflon™ ADS; 1.5-2.2 mils dft) per instructions on the technical data bulletin, using multiple passes. Brush and roll (solid color) may require two coats.
b. (Coraflon™ ADS) Metallic coatings require a clear finish coat. The clear coat protects the aluminum pigmentation from the ultra-violet degradation. Allow metallic topcoat to dry 4 hours minimum before top coating. Coastal environments require a clear coat. ADS 650 Barrier coat maybe needed for mica colors.
c. Final cure will be achieved in three to five days.

## 3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean substrates of substances that could impair bond of the various coatings. Remove oil and grease before cleaning.
1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.
1. Provide barrier coats over incompatible primers or remove and reprime.
2. Provide barrier coats over incompatible primers or remove primers and reprime substrate.
3. Ferrous Metal Substrates: Clean ungalvanized ferrous-metal surfaces that have not been shop coated: remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with SSPC recommendations.
a. Blast-clean steel surfaces as recommended by coating manufacturer and according to SSPC-SP 10.
b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire brush, solvent clean, and touch up with same primer as the shop coat.
4. Nonferrous-Metal Substrates: Clean nonferrous and galvanized surfaces according to manufacturer's written instructions for the type of service, metal substrate, and

application required.
a. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

D. Material Preparation: Carefully mix and prepare coating materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying coatings in a clean condition, free of foreign materials and residue.
2. Stir materials before applying to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into the material. Remove film and, if necessary, strain coating material before using.
3. Use only the type of thinners approved by manufacturer and only within recommended limits.
4. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

## 3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

B. General: Apply high-performance coatings according to manufacturer's written instructions.
1. Use applicators and techniques best suited for the material being applied.
2. Do not apply high-performance coatings over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to forming a durable coating film.
3. Coating surface treatments, and finishes are indicated in the coating system descriptions.
4. Provide finish coats compatible with primers used.
5. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, grilles, covers for finned-tube radiation, and similar components are in place. Extend coatings in these areas, as required, to maintain system integrity and provide desired protection.

C. Application Procedures: Apply coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. The number of coats and film thickness required is the same regardless of application method.
2. Completed Work: Match approved Samples for color, texture, and coverage. Remove, refinish, or recoat work that does not comply with specified requirements.

## 3.4 FIELD QUALITY CONTROL

A. Owner reserves the right to invoke the following test procedure at any time and as often as Owner deems necessary during the period when paint is being applied:
1. Owner will engage a qualified independent testing agency to sample paint material being used. Samples of material delivered to Project will be taken, identified, sealed, and certified in the presence of Contractor.
2. Owner may direct Contractor to stop painting if test results show material being used does not comply with specified requirements. Contractor shall remove noncomplying paint from Project site, pay for testing, and repaint surfaces previously coated with the noncomplying paint. If necessary, Contractor may be required to remove noncomplying paint from previously painted surfaces if, on repainting with specified paint, the two coatings are incompatible.

## 3.5 CLEANING

A. After completing painting, clean glass and paint spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

## 3.6 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage from painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protective wrappings provided by others to protect their work.

C. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces.

END OF SECTION

# SECTION 09 90 13
# EXTERIOR PAINTS & COATINGS FOR CONCRETE VERTICAL SURFACES

## PART 1 - GENERAL

### 1.1 SECTION INCLUDES

A. Exterior paint and coating systems including surface preparation.

### 1.2 REFERENCES

A. Steel Structures Painting Council (SSPC):
   1. SSPC-SP 1 - Solvent Cleaning.
   2. SSPC-SP 13 / NACE No. 6 Surface Preparation for Concrete.

B. Material Safety Data Sheets / Environmental Data Sheets: Per manufacturer's MSDS/EDS for specific VOCs (calculated per 40 CFR 59.406). VOCs may vary by base and sheen.

### 1.3 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: For each paint system indicated, including.
   1. Product characteristics.
   2. Surface preparation instructions and recommendations.
   3. Primer requirements and finish specification.
   4. Storage and handling requirements and recommendations.
   5. Application methods.
   6. Cautions for storage, handling and installation.

C. Selection Samples: Submit a complete set of color chips that represent the full range of manufacturer's products, colors and sheens available.

D. Verification Samples: For each finish product specified, submit samples that represent actual product, color, and sheen.

E. Only submit complying products based on project requirements (i.e. LEED). One must also comply with the regulations regarding VOCs (CARB, OTC, SCAQMD, LADCO). To ensure compliance with district regulations and other rules, businesses that perform coating activities should contact the local district in each area where the coating will be used.

F. USGBC LEED V4 Submittals:
   1. MRc2 Environmental Product Declaration Product Language: Products shall be selected with a preference to products that have product-specific environmental product declaration documentation.
   2. EQc2 Low Emitting Materials: The VOC content of all adhesives, sealants, paints and coatings in this Section shall not exceed the VOC limits established in Division 01 Sustainable Design sections.

### 1.4 QUALITY ASSURANCE

A. Installer Qualifications: Applicator shall be licensed and shall have at least 3-years' experience in installing materials of types specified and shall have successfully completed at

least three projects of similar scope and complexity.

B. Paint exposed surfaces. If a color of finish, or a surface is not specifically mentioned, Architect will select from standard products, colors and sheens available.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels unless indicated.

D. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish surfaces for verification of products, colors and sheens.
   2. Finish area designated by Architect.
   3. Provide samples that designate primer and finish coats.
   4. Do not proceed with remaining work until the Architect approves the mock-up.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery: Deliver manufacturer's unopened containers to the work site. Packaging shall bear the manufacturer's name, label, and the following list of information.
   1. Product name, and type (description).
   2. Application and use instructions.
   3. Surface preparation.
   4. VOC content.
   5. Environmental handling.
   6. Batch date.
   7. Color number.

B. Storage: Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

C. Store materials in an area that is within the acceptable temperature range, per manufacturer's instructions. Protect from freezing.

D. Handling: Maintain a clean, dry storage area, to prevent contamination or damage to the coatings.

## 1.6 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

## 1.7 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

B. Furnish Owner with an additional one percent of each material and color, but not less than 1 gal (3.8 l) or 1 case, as appropriate.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

A. Basis-of-Design Product: Sherwin-Williams, which is located at:13680 NW 5th St, Suite 120 Sunrise, FL. 33325. Glenn Remler (954) 547-1217 Glenn.J.Remler@Sherwin.com

B. Requests for substitutions will be considered in accordance with provisions of Division 01 and must be Approved by the Architect.

### 2.2 APPLICATIONS/SCOPE

A. Exterior Paint and Coating Systems:
   1. Concrete: Cementitious siding, flexboard, transite, and shingles; non-roof.

### 2.3 PAINT MATERIALS - GENERAL

A. Paints and Coatings:
   1. Unless otherwise indicated, provide factory-mixed coatings. When required, mix coatings to correct consistency in accordance with manufacturer's instructions before application. Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
   2. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as base color. Or follow manufactures product instructions for optimal color conformance.

B. Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer. Where Xypex or other water repellent is provided within concrete, a “best” primer shall be used.

C. Coating Application Accessories: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required, per manufacturer's specifications.

D. Color: Refer to Finish Schedule for paint colors, and as selected.

### 2.4 EXTERIOR PAINT AND COATING SYSTEMS

A. Concrete**: Cementitious Siding, Flexboard, Transite Board, Non-Roof Shingles, Common Brick, Stucco, Tilt-up, Precast, and Poured-in-place Cement.
   1. Textured and Smooth Systems:
      a. Smooth (Waterbased Finish):
         1) 1st Coat: S-W Loxon XP, LX21W50 Series, Satin Finish.
         2) 2nd Coat: S-W Loxon XP, LX21W50 Series, Satin Finish. (14.0-18.0 mils wet; 6.4-8.3 mils dry per coat).

**** Concrete PH level of 6 to 13. Apply 13 to 16.4 mils total dry film thickness for waterproofing system. 10 or less pinholes per square foot**

## PART 3 EXECUTION

### 3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared; notify Architect of unsatisfactory conditions before proceeding. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

B. Proceed with work only after conditions have been corrected and approved by all parties, otherwise application of coatings will be considered as an acceptance of surface conditions.

C. Application of systems indicates acceptance of surfaces and conditions by the Installer.

### 3.2 SURFACE PREPARATION

A. General: Surfaces shall be dry and in sound condition. Remove oil, dust, dirt, loose rust, peeling paint or other contamination to ensure good adhesion.
   1. Prior to attempting to remove mildew, it is recommended to test any cleaner on a small, inconspicuous area prior to use. Bleach and bleaching type cleaners may damage or discolor existing paint films. Bleach alternative cleaning solutions are advised.
   2. Remove mildew before painting by washing with a solution of 1 part liquid household bleach and 3 parts of warm water. Apply solution and scrub the mildewed area. Allow solution to remain on the surface for 10 minutes. Rinse thoroughly with clean water and allow surface to dry before painting. Wear protective glasses or goggles, waterproof gloves, and protective clothing. Quickly wash off any of the mixture that comes in contact with your skin. Do not add detergents or ammonia to the bleach/water solution.
   3. Remove items including but not limited to thermostats, electrical outlets, switch covers and similar items prior to painting. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.
   4. No exterior painting should be done immediately after a rain, during foggy weather, when rain is predicted, or when the temperature is below 50 degrees F (10 degrees C), unless products are designed specifically for these conditions. On large expanses of metal siding, the air, surface and material temperatures must be 50 degrees F (10 degrees F) or higher to use low temperature products.

B. Concrete, SSPC-SP13 or NACE 6: This standard gives requirements for surface preparation of concrete by mechanical, chemical, or thermal methods prior to the application of bonded protective coating or lining systems. The requirements of this standard are applicable to all types of cementitious surfaces including cast-in-place concrete floors and walls, precast slabs, masonry walls, and shotcrete surfaces. An acceptable prepared concrete surface should be free of contaminants, laitance, loosely adhering concrete, and dust, and should provide a sound, uniform substrate suitable for the application of protective coating or lining systems.

### 3.3 INSTALLATION

A. Apply all coatings and materials with the manufacturer's specifications in mind. Mix and thin coatings according to manufacturer's recommendations.

B. Do not apply to wet or damp surfaces. Wait at least 30 days before applying to new concrete or masonry. Or follow manufacturer's procedures to apply appropriate coatings prior to 30

days. Test new concrete for moisture content. Wait until wood is fully dry after rain or morning fog or dew.

C. Apply coatings using methods recommended by manufacturer.

D. Uniformly apply coatings without runs, drips, or sags, without brush marks, and with consistent sheen.

E. Apply coatings at spreading rate required to achieve the manufacturers recommended dry film thickness.

F. Regardless of number of coats specified, apply as many coats as necessary for complete hide, and uniform appearance.

G. Inspection: The coated surface must be inspected and approved by the Architect just prior to the application of each coat.

**3.4 PROTECTION**

A. Protect finished coatings from damage until completion of project.

B. Touch-up damaged coatings after substantial completion, following manufacturer's recommendation for touch up or repair of damaged coatings. Repair any defects that will hinder the performance of the coatings.

END OF SECTION

# SECTION 10 14 00

# SIGNAGE

## PART 1 – GENERAL

### 1.1 SECTIONS INCLUDED

A. Room and door signs.

B. Emergency evacuation maps.

### 1.2 PRICE AND PAYMENT PROCEDURE

A. Room and door signs are not covered by allowance.

B. Allowance amount covers purchase and delivery but not installation.

### 1.3 REFERENCE STANDARDS

A. 36 CFR 1191 – Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities; Final Rule; current edition; (ADA Standards for Accessible Design).

B. ANSI/ICC A117.1 – American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 2009.

### 1.4 SUBMITTALS

A. See Section 01 33 00 for submittal procedures.

B. Product Date: Manufacturer's printed product literature for each type of sign, indicating sign style, font, foreground and background colors, locations, overall dimensions of each sign.

C. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts and colors.
   1. When room numbers to appear on signs differ from those on the drawings, include the drawing room number on schedule.
   2. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
   3. Submit for approval by Owner through Architect prior to fabrication.

D. Samples: Submit two samples of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment.

E. Selection Samples: where colors are not specified, submit two sets of color selection charts or chips.

F. Verification Samples: Submit samples showing colors specified.

G. Manufacturer's Installation Instructions: Include installation template and attachment devices.

H. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Curved Sign Media Suction Cups: One for each 100 signs; for removing media.

### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Package room and door signs in sequential order of installation, labeling by floor or building.

C. Store tape adhesive at normal room temperature.

### 1.6 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain this minimum temperature during and after installation of signs.

## PART 2 - PRODUCTS

### 2.1 BASIS-OF-DESIGN MANUFACTURERS:

A. Flat Signs:
   1. Best Sign Systems, Inc.: www.bestsigns.com
   2. Mohawk Sign Systems, Inc: www.mohawksign.com
   3. Seton Identification Products: www.seton.com/aec
   4. Approved equal

### 2.2 SIGNAGE APPLICATIONS:

A. Accessibility Compliance: All signs are required to comply with ADA Standards for Accessible Design and ANSI/ICC A 117.1 and applicable building codes, unless otherwise indicated in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

B. Room and Door Signs: Provide a sign for every doorway, whether it has a door or not, not including corridors, lobbies, and similar open areas.
   1. Sign Type: Flat signs with engraved panel media as specified.
   2. Provide "tactile" signage, with letters raised minimum 1/32 inch (0.8 mm) and

Grade II braille.
3. Character Height: 1 inch (25 mm)
4. Sign Height: 2 inches (50 mm) unless otherwise indicated.
5. Office Doors: Identify with room numbers to be determined later, not the numbers shown on the drawings.
6. Conference and Meeting Rooms: Identify with room numbers to be determined later, not the numbers shown on the drawings.
7. Service Rooms: Identify with room names and numbers to be determined later, not those shown on the drawings.
8. Rest Rooms: Identify with pictograms, the names “MEN” and “WOMEN”, room numbers to be determined later, and braille.

C. Interior Directional and Informational Signs:
1. Sign Type: Same as room and door signs.
2. Sizes: As indicated on the drawings.
3. Working of signs is scheduled on the drawings.

D. Emergency Evacuation Maps:
1. Allow for one map per elevator lobby.
2. Map content to be provided by Owner.

E. Building Identification Signs.

**2.3 SIGN TYPES:**

A. Flat Signs: Signage media in aluminum frame.
1. Corners: Square
2. Frame Finish: Natural (clear) anodized.
3. Wall mounted on one-sided signs: Tape adhesive.

B. Radius/Curved Signs: One-piece, curved extruded aluminum media holder securing flat, flexible sign media by curved lip on two sides; other two sides closed by end caps; concealed mounting attachment.

1. Sizes: As indicated on drawings.
2. Finish: Natural (clear) anodized
3. Sign Orientation: Curved in horizontal section.
4. Wall Mounting on One-Sided Signs: Mechanical anchorage, with predrilled holes, and set in clear silicone sealant.

C. Color and Font: Unless otherwise indicated:
1. Character Font: Helvetica or Arial.
2. Character Case: Upper case only
3. Background Color: Clear
4. Character Color: Contrasting color

**2.4 TACTILE SIGNAGE MEDIA**

A. Engraved Panels: Laminated colored plastic; engraved through face to expose core as background color.
   1. Total Thickness: 1/16 inch (1.6 mm).

### 2.5 DIMENSIONAL LETTERS

A. Metal Letters:
   1. Mounting: Tape Adhesive

### 2.6 ACCESSORIES

A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.

B. Tape Adhesive: Double sided tape, permanent adhesive.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Verify that substrate surfaces are ready to receive work

### 3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install neatly, with horizontal edged level.

C. Locate signs where indicated:
   1. Room and Door Signs: Locate on wall at latch side of door with centerline of sign at 60 inches (1525 mm) above finished door.
   2. If no location is indicated obtain Owner's instruction.

**END OF SECTION**

# SECTION 10 44 00

# FIRE PROTECTION SPECIALTIES

## PART 1 – GENERAL

### 1.1 SECTION INCLUDES

A. Fire extinguishers
B. Fire extinguisher cabinets
C. Accessories

### 1.2 REFERENCE STANDARDS

A. NFOA 10 – Standard for Portable Fire Extinguishers: 2010
B. UL (FPED) – fire Protection Equipment Directory; Underwriters Laboratories Inc.; current edition.

### 1.3 SUBMITTALS

A. See Section 01 33 00 for submittal procedures.
B. Shop Drawings: Indicate location, dimensions, mounting methods, relationship to surrounding construction, details for cabinet type, materials, trim style and door hardware.
C. Product Data: Provide extinguisher operation features.
D. Maintenance Date: Include test, refill or recharge schedules and re-certification requirements.
E. Provide fire extinguishers of type approved by UL, State Fire Marshal's Office, and local regulatory agencies.
F. LEED Requirements:
    1. Submit documentation certifying the products do not contain CFCs, HCFCs or halons.

### 1.4 DELIVERY, STORAGE AND HANDLING

A. Delivery, store, and handle fire protection specialties and related materials using means and methods that will prevent damage, deterioration, or loss.

### 1.5 WARRANTY

A. All fire protection products (except fire extinguishers) carry a one-year warranty after date of shipment against defects in materials and workmanship. Fire extinguishers carry a longer warranty. We will replace or repair any product found defective within this period.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS:

A. Fire Extinguishers: 10 lb. capacity:
   1. Ansul, Inc: www.ansul.com
   2. Pyro-Chem: www.pyrochem.com
   3. JL Industries, Inc.: www.jlindustries.com
   4. Substitutions: See Section 01 60 00 – Product Requirements.

### 2.2 FIRE EXTINGUISHERS

A. Fire Extinguishers – General: Comply with product requirements of NFPA 10 and applicable codes, whichever is more stringent.
   1. Provide extinguishers labeled by UL for the purpose specified and indicated.

B. Foam type Fire Extinguishers: Stainless steel tank, with pressure gauge.
   1. Class: A: B: C: - 10 lb.
   2. Temperature Range: 40 degrees F (5 degrees C) to 120 degrees F (49 degrees C).

### 2.3 FIRE EXTINGUISHER CABINETS

A. Metal ACADEMY SERIES – Aluminum Fire Extinguisher Cabinet:
   1. Cabinet with aluminum trim and door, cabinet style-recessed, semi-recessed, surface mounted. See plans for type.
   2. Tub-cold-rolled-steel-white factory applied power coat finish. Anodized aluminum for surface mounted cabinets.
   3. Door and Trim Construction: Aluminum: Flush doors with 5/8” door stop attached by continuous hinge and equipped with zinc plated handle with roller catch. Factory anodized finish-clear. Door style G-Full glazing with SAF-T-LOK TM, theft deterrent, pull handle. Door glazing Type 10: Clear acrylic.

B. Polystyrene: CATO – Chief Fire extinguisher cabinets – Model 105-10 (10lb). RRC or equal-frame injection molded of red virgin high-impact crystal polystyrene of .110 wall thickness with ultra-violet inhibitors, virgin acrylic Plaskolite panel of .080 thickness, cylinder lock and key, polypropylene plastic injected molded hammer with flexible torsion, ribbed grip surface, and clear nylon-jacketed stainless-steel mechanical cable.

C. Cabinet Configuration: Recesses, semi recessed and surface mounted types. See plans for exact locations and types.

### 2.4 ACCESSORIES

A. Extinguisher brackets: Formed steel, chrome-plated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine walls and partitions for suitable framing depth and blocking where recessed and semi-recessed cabinets will be installed, and blocking where surface mounted cabinets will be installed.
   1. Notify the Contractor in writing of conditions detrimental to proper and timely completion of the installation.
   2. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

A. Install cabinets in locations and at mounting heights indicated, or if not indicated, at heights to comply with applicable regulations of governing authorities.
   1. Prepare recesses in walls for fire extinguisher cabinets as required by type and size of cabinet and style of time and to comply with manufacturer's instructions.
   2. Securely fasten mounting brackets and fire extinguisher cabinets to structure, square and plumb, to comply with manufacturer's instructions.
   3. Maintain fire ratings where cabinets are recessed into fire-rated wall systems.

B. Wall Signs:
   1. Location: Where shown or directed.
   2. Apply on walls after field painting is completed and has been accepted.

C. Cabinet Lettering:
   1. Location: where shown or directed.
   2. Apply lettering on field-painted fire protection cabinets after painting is complete and has been accepted.
   3. Apply lettering on factory-finished (no further painting specified) either at the factory or just prior to substantial completion.

### 3.3 FIELD QUALITY WORK

A. Ensure that each extinguisher is fully charged, and that inspection of each extinguisher has been performed, as evidenced by the National Association of Fire Equipment Distributors certification tag, just prior to turnover.

### 3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.

B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturer.

E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

**END OF SECTION**

# SECTION 11 68 00

# PLAYFIELD EQUIPMENT AND STRUCTURES

## PART 1 GENERAL

### 1.1 RELATED DOCUMENTS

A. Playground Equipment and accessories.

### 1.2 RELATED SECTIONS

A. Section 32 18 16.33 – Playground Safety Surfacing

### 1.3 SCOPE: Furnish labor, material, and equipment necessary to provide and install the play equipment as shown on the drawings and as specified herein.

### 1.4 REFERENCES

A. ASTM F1487-17 - Standard Consumer Safety Performance Specification for Playground Equipment for Public Use.

B. ASTM F2373 – Standard Consumer Safety Performance for Public Use Play Equipment for Children 6 months through 23 Months.

C. 2010 ADA Standard for Accessible Design

D. U. S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities

E. ICC A117.1 for playground equipment designated as accessible.

F. CPSC Technical Safety Guidelines for Public Playgrounds

G. IPEMA (International Play Equipment Manufacturers Association) Certification

H. Certified Playground Safety Inspector (CPSI)

### 1.5 SUBMITTALS

A. Submit under provisions of Section 01 31 00 - Administrative Requirements

B. Layout: Upon request, provide layout drawing showing equipment size and locations, required safety zones, signage locations, age range for each area.

C. Product Data: Upon request, provide product data for each selected equipment item

D. Selection Samples: Upon request, provide samples for each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns for each material utilized in specified play items.

E. Installation Documentation: All shipments shall include a packet of order-specific, step-by-step instructions for assembly of each component, including equipment assembly diagrams, estimated

hours for assembly, footing dimensions, concrete quantity for direct bury components, fall height information, and area required information. For Kompan products (except for custom items), these are available at www.kompanmaster.com

F. Upon request: Provide sealed engineering drawings as needed for permitting and construction.

G. LEED: Upon request, provide recycled material data and FSC wood certification (if applicable) for selected products.

## 1.6 QUALITY ASSURANCE

A. Manufacturer’s representative and/or designer to be Certified Playground Safety Inspector (CPSI).

B. Manufacturer Qualifications: Minimum 5-year experience manufacturing similar products.

C. All play structures shall be certified and validated to be in conformance with the ASTM F1487 Standard.

D. In US, all play structures to be in conformance with ASTM F2373.

E. To the best of manufacturer's belief and knowledge play structures to conform to the U.S. Consumer Products Safety Commission (CPSC) Guidelines.

F. All playground equipment to be certified by IPEMA.

G. Accessibility:

1. Unless otherwise noted, playground is accessible according to the 2010 ADA Standard for Accessible Design.

2. Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for playground equipment designated as accessible.

3. Manufacturer’s equipment shall integrate play opportunities for all abilities within the same play equipment items and locations, rather than provide separate ADA-specific play items and areas.

4. Designer/Engineer to confirm paths, ramps, gates, parking, restrooms (if any), and water fountains (if any), serving playground meet accessibility codes and guidelines.

5. Upon request, manufacturer to provide play components listing with product literature for each structure to verify ADA compliance of overall design.

H. Coordinate playground surfacing critical fall heights and maximum fall heights of specified equipment items per above standards.

## 1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.

B. Packaging: Components shall be individually wrapped or bulk wrapped to provide protection during shipment. Small parts and hardware packages will be placed in crates for shipment. The components and crates are then shrink-wrapped to skids (pallets) to ensure secure shipping.

C. Handling: Handle materials to avoid damage.

D. Protect products from damage and theft during construction.

## 1.8 PROJECT CONDITIONS

A. Confirm environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

## 1.9 SEQUENCING

A. Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

B. Coordinate site preparation, surfacing installation and other related work.

## 1.10 WARRANTY - Only as applies to specified equipment.

A. LIFETIME WARRANTY: Galvanized structural parts: steel poles, cross beams, floor frames, top brackets; stainless steel hardware; EcoCore and other HDPE panels. Lifetime Warranty is in effect for the lifetime of the product until the product is uninstalled and/or taken out of use.

B. MINIMUM 10-YEAR WARRANTY: HPL floors and panels; galvanized and aluminum metal parts with painted top layer; other galvanized metal parts; other stainless-steel parts; Corocord rope; S clamps of stainless steel; solid plastic parts; hollow plastic parts; non-painted metal parts; Robinia and Siberian larch wood; Other engineered Timber.

C. MINIMUM 5-YEAR WARRANTY: Resin-coated plywood plates; other painted metal parts; springs and ball bearing assemblies; other rope and net constructions; concrete elements.

D. MINIMUM 2-YEAR WARRANTY: Movable plastic and metal parts; EPDM rubber membranes material; electronic components; sunshades and sail solutions.

E. Saltwater exposure and coastal environments may justify reduced warranties.

# PART 2 PRODUCTS

## 2.1 MANUFACTURERS

A. Acceptable Manufacturer and basis of design: Kompan Inc. – 605 W Howard Lane, Suite 101, Austin, TX 78753; www.kompan.us; 800-426-9788; installation and product information available at www.kompanmaster.com

B. Substitutions: Not permitted. OR

C. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

D. Basis of design is Kompan product lines. Substitutions for each piece of equipment to be considered against this standard. Equipment submitted for substitution to be equivalent in design, layout, deck size, post size, fastening system, ADA accessibility, appearance, color, and construction detail to playground equipment specified in the drawings. Reasonable variations may be allowed at the Owner’s discretion. Play value and safety features of components must be equal or superior to specified design as judged by the Owner or Owner’s representative.

E. Manufacturers to be ISO 9001 certified.

F. Manufacturer’s standard products to be IPEMA certified.

## 2.2 MATERIAL – GENERAL

A. Material: All materials shall be structurally sound and suitable for safe play.

B. No PVC shall be present on any portion of the equipment.

C. Lead content below 90ppm for surfaces, below 100 ppm for base material.

D. All materials and equipment to follow standards listed in Part 1.

**2.3 COMPONENTS: ACCEPTABLE MATERIALS AND PROPERTIES** – If provided, the following must be standard. Other non-specified components may be used.

A. PLAY PANELS: EcoCore – vandal-resistant, layered 100% recycled HDPE core, recyclable after use.

B. FLOORS/DECKS: Aluminum profile, supported with multiple attachment options for maximum customization, HPL .7” thick, non-skid surface texture.

C. ROPE: Wear and vandalism resistant galvanized, six-stranded steel wires and steel core; each strand wrapped with PES yarn, melted onto each strand.

D. FASTENERS: Stainless steel or Delta coated for corrosion protection.

E. MAIN POSTS: Acceptable options

1. Galvanized steel with powder coated finish

2. Color-anodized lead-free aluminum

3. Stainless steel or Delta coated for corrosion protection.

F. GALVANIZED STEEL: Maintenance free, hot-dip galvanized inside and outside with lead-free zinc, according to global safety standards for playground equipment.

**2.4 PLAY EQUIPMENT SCHEDULE** – See drawings for locations and quantities of each item. If no items listed below, see drawings for equipment schedule. Permanent signs or labels indicating age groups for each area are required in US.

## PART 3

## PART 4 EXECUTION

### 4.1 EXAMINATION

A. Verify correct location for installation of equipment. Confirm acceptable subgrade preparation, drainage, fencing, any other condition required for proper installation and performance of equipment.

B. Confirm any previous equipment, surfacing, or fencing to be removed has been removed, holes filled and compacted.

C. Do not begin installation until site has been properly prepared. If substrate preparation is the responsibility of another party, notify them of unsatisfactory preparation before proceeding.

D. Verify locations of any existing utilities through site to avoid conflicts with footers or fall zones.

E. Identify any possible obstructions lying within required equipment safety fall zones.

### 4.2 PREPARATION

A. Per drawings and specifications. Level site to between 1% and 2% slope unless otherwise noted. Excavate site as needed to accommodate thickness of subbase (if any), cushioning, and surfacing materials and achieve desired final surface elevation in relation to surrounding grade. See playground surfacing specifications for more information.

B. Lay out equipment locations and fall zones on site and verify fall zones are free and clear with no trees, existing equipment, or other obstructions.

C. Verify equipment delivered to site is correct, undamaged, and complete prior to starting assembly or installation. Verify all hardware and accessories are present prior to starting installation. Contact manufacturer’s representative to replace missing or damaged items.

D. Review manufacturer’s installation instructions, included with each item, and contact manufacturer with any questions.

### 4.3 INSTALLATION

A. Install all playground equipment as shown on drawings and per manufacturer’s instructions, approved submittals, and in proper relationship with adjacent construction.

B. Contact manufacturer with installation questions to prevent damage to equipment.

C. For Kompan equipment, all installation instructions(except for custom items) and product information for basis of design product is available on www.kompanmaster.com.

D. Protect construction area from trespassers with orange plastic construction fencing or similar until installation and final safety inspections are complete.

E. Align all posts vertically and decks level. All equipment shall be securely anchored and in proper working order.

F. Coordinate final elevation of playground equipment with finished elevation of any playground safety surfacing for area.

G. Touch up any scratched surfaces with paint provided by manufacturer.

## 4.4 INSPECTION

A. Manufacturer's representative to inspect completed installation for safety and relevant standard compliance prior to use. Notify installer of any items to be corrected. All corrections to be made prior to use.

## 4.5 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

**END OF SECTION**

# SECTION 220513 - COMMON MOTOR REQUIREMENTS FOR PLUMBING EQUIPMENT

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on alternating-current power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

### 1.2 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

## PART 2 - PRODUCTS

### 2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with NEMA MG 1 unless otherwise indicated.

### 2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

### 2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Premium efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Rotor: Random-wound, squirrel cage.

F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

G. Temperature Rise: Match insulation rating.

H. Insulation: Class F.

I. Code Letter Designation:

1. Motors 15 HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller Than 15 HP: Manufacturer's standard starting characteristic.

J. Enclosure Material: Cast iron for motor frame sizes 324T and larger; rolled steel for motor frame sizes smaller than 324T.

## 2.4 ADDITIONAL REQUIREMENTS FOR POLYPHASE MOTORS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable-Frequency Controllers: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width-modulated inverters.
2. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
3. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

## 2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 220513

# SECTION 220516 - EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Rubber union connector packless expansion joints.
2. Flexible-hose packless expansion joints.
3. Externally pressurized metal-bellows packless expansion joints.
4. Alignment guides and anchors.
5. Pipe loops and swing connections.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Delegated-Design Submittal: For each anchor and alignment guide, including analysis data, signed and sealed by the qualified professional engineer responsible for their preparation.

1. Design Calculations: Calculate requirements for thermal expansion of piping systems and for selecting and designing expansion joints, loops, and swing connections.
2. Anchor Details: Detail fabrication of each anchor indicated. Show dimensions and methods of assembly and attachment to building structure.
3. Alignment Guide Details: Detail field assembly and attachment to building structure.
4. Schedule: Indicate type, manufacturer's number, size, material, pressure rating, end connections, and location for each expansion joint.

### 1.3 INFORMATIONAL SUBMITTALS

A. Welding certificates.

### 1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

### 1.5 QUALITY ASSURANCE

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

B. Pipe and Pressure-Vessel Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

A. Compatibility: Products shall be suitable for piping service fluids, materials, working pressures, and temperatures.

B. Capability: Products to absorb 200 percent of maximum axial movement between anchors.

### 2.2 PACKLESS EXPANSION JOINTS

A. Rubber Union Connector Expansion Joints RUEJ:

1. Material: Twin reinforced-rubber spheres.
2. Minimum Pressure Rating: 150 psig at 170 deg F, unless otherwise indicated.
3. End Connections for NPS 2 and Smaller: Threaded.

B. Flexible-Hose Packless Expansion Joints FHEJ:

1. Description: Manufactured assembly with inlet and outlet elbow fittings and two flexible-metal-hose legs joined by long-radius, 180-degree return bend or center section of flexible hose.
2. Flexible Hose: Corrugated-metal inner hoses and braided outer sheaths.
3. Expansion Joints for Copper Tubing NPS 2 and Smaller: Copper-alloy fittings with solder-joint end connections.
    a. Bronze hoses and single-braid bronze sheaths with 450 psig at 70 deg F and 340 psig at 450 deg F ratings.
4. Expansion Joints for Copper Tubing NPS 2-1/2 to NPS 4: Copper-alloy fittings with threaded end connections.
    a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 300 psig at 70 deg F and 225 psig at 450 deg F ratings.
5. Expansion Joints for Steel Piping NPS 2 and Smaller: Carbon-steel fittings with threaded end connections.
    a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 450 psig at 70 deg F and 325 psig at 600 deg F ratings.
6. Expansion Joints for Steel Piping NPS 2-1/2 to NPS 6: Carbon-steel fittings with flanged end connections.

a. Stainless-steel hoses and single-braid, stainless-steel sheaths with 200 psig at 70 deg F and 145 psig at 600 deg F ratings.

C. Externally Pressurized Metal-Bellows Packless Expansion Joints EPEJ:

1. Minimum Pressure Rating: 150 psig, unless otherwise indicated.
2. Description:

a. Totally enclosed, externally pressurized, multi-ply, stainless-steel bellows isolated from fluid flow by an internal pipe sleeve.
b. Carbon-steel housing.
c. Drain plugs and lifting lug for NPS 3 and larger.
d. Bellows shall have operating clearance between the internal pipe sleeves and the external shrouds.
e. Joints shall be supplied with a built-in scale to confirm the starting position and operating movement.
f. Joint Axial Movement: 4 inches of compression and of extension.

3. Permanent Locking Bolts: Set locking bolts to maintain joint lengths during installation. Temporary welding tabs that are removed after installation in lieu of locking bolts are not acceptable.
4. End Connection Configuration: Flanged; one raised, fixed and one floating flange.

## 2.3 ALIGNMENT GUIDES AND ANCHORS

A. Alignment Guides AG:

1. Description: Steel, factory-fabricated alignment guide, with bolted two-section outer cylinder and base for attaching to structure; with two-section guiding slider for bolting to pipe.

B. Anchor Materials:

1. Steel Shapes and Plates: ASTM A 36/A 36M.
2. Bolts and Nuts: ASME B18.10 or ASTM A 183, steel hex head.
3. Washers: ASTM F 844, steel, plain, flat washers.
4. Mechanical Fasteners: Insert-wedge-type stud with expansion plug anchor for use in hardened portland cement concrete, with tension and shear capacities appropriate for application.

a. Stud: Threaded, zinc-coated carbon steel.
b. Expansion Plug: Zinc-coated steel.
c. Washer and Nut: Zinc-coated steel.

5. Chemical Fasteners: Insert-type stud, bonding-system anchor for use with hardened portland cement concrete, with tension and shear capacities appropriate for application.

a. Bonding Material: ASTM C 881/C 881M, Type IV, Grade 3, two-component epoxy resin suitable for surface temperature of hardened concrete where fastener is to be installed.
b. Stud: ASTM A 307, zinc-coated carbon steel with continuous thread on stud, unless otherwise indicated.
c. Washer and Nut: Zinc-coated steel.

## PART 3 - EXECUTION

### 3.1 EXPANSION JOINT INSTALLATION

A. Install expansion joints of sizes matching sizes of piping in which they are installed.

B. Install metal-bellows expansion joints according to EJMA's "Standards of the Expansion Joint Manufacturers Association, Inc."

### 3.2 PIPE LOOP AND SWING CONNECTION INSTALLATION

A. Install pipe loops cold-sprung in tension or compression as required to partly absorb tension or compression produced during anticipated change in temperature.

B. Connect risers and branch connections to mains with at least five pipe fittings, including tee in main.

C. Connect risers and branch connections to terminal units with at least four pipe fittings, including tee in riser.

D. Connect mains and branch connections to terminal units with at least four pipe fittings, including tee in main.

### 3.3 ALIGNMENT-GUIDE AND ANCHOR INSTALLATION

A. Install alignment guides to guide expansion and to avoid end-loading and torsional stress.

B. Install one guide(s) on each side of pipe expansion fittings and loops. Install guides nearest to expansion joint not more than four pipe diameters from expansion joint.

C. Attach guides to pipe, and secure guides to building structure.

D. Install anchors at locations to prevent stresses from exceeding those permitted by ASME B31.9 and to prevent transfer of loading and stresses to connected equipment.

E. Anchor Attachments:

1. Anchor Attachment to Steel Pipe: Attach by welding. Comply with ASME B31.9 and ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
2. Anchor Attachment to Copper Tubing: Attach with pipe hangers. Use MSS SP-69, Type 24; U bolts bolted to anchor.

F. Fabricate and install steel anchors by welding steel shapes, plates, and bars. Comply with ASME B31.9 and AWS D1.1/D1.1M.

1. Anchor Attachment to Steel Structural Members: Attach by welding.
2. Anchor Attachment to Concrete Structural Members: Attach by fasteners. Follow fastener manufacturer's written instructions.

G. Use grout to form flat bearing surfaces for guides and anchors attached to concrete.

END OF SECTION 220516

# SECTION 220517 - SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Sleeves.
2. Sleeve-seal systems.
3. Grout.
4. Silicone sealants.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

### 1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

## PART 2 - PRODUCTS

### 2.1 SLEEVES

A. Cast-Iron Pipe Sleeves: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop collar.

B. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, anticorrosion coated or galvanized, with plain ends and integral welded waterstop collar.

C. Galvanized-Steel Sheet Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

D. PVC Pipe Sleeves: ASTM D 1785, Schedule 40.

### 2.2 SLEEVE-SEAL SYSTEMS

A. Description:

1. Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
2. Designed to form a hydrostatic seal of 20 psig minimum.
3. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
4. Pressure Plates: Stainless steel, Type 316.
5. Connecting Bolts and Nuts: Stainless steel, Type 316 of length required to secure pressure plates to sealing elements.

## 2.3 GROUT

A. Description: Nonshrink, for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

## 2.4 SILICONE SEALANTS

A. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant, ASTM C 920, Type S, Grade NS, Class 25, Use NT.

B. Silicone, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT. Grade P Pourable (self-leveling) formulation is for opening in floors and other horizontal surfaces that are not fire rated.

# PART 3 - EXECUTION

## 3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Cut sleeves to length for mounting flush with both surfaces.

    a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

2. Using grout or silicone sealant, seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.

E. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping and fill materials specified in Section 078413 "Penetration Firestopping."

## 3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

## 3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After allowing for a full cure, test sleeves and sleeve seals for leaks. Repair leaks and retest until no leaks exist.

B. Sleeves and sleeve seals will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

## 3.4 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls above Grade:

    a. Piping Smaller Than NPS 6: Cast-iron pipe sleeves.
    b. Piping NPS 6 and Larger: Cast-iron pipe sleeves.

2. Exterior Concrete Walls below Grade:

    a. Piping Smaller Than NPS 6: Cast-iron pipe sleeves with sleeve-seal system.

        1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

    b. Piping NPS 6 and Larger: Cast-iron pipe sleeves with sleeve-seal system.

        1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

    a. Piping Smaller Than NPS 6: Cast-iron pipe sleeves with sleeve-seal system.

        1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

    b. Piping NPS 6 and Larger: Cast-iron pipe sleeves with sleeve-seal system.

        1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

4. Concrete Slabs above Grade:

    a. Piping Smaller Than NPS 6: PVC pipe sleeves.
    b. Piping NPS 6 and Larger: PVC pipe sleeves.

5. Interior Partitions:

    a. Piping Smaller Than NPS 6: Steel pipe sleeves.
    b. Piping NPS 6 and Larger: Galvanized-steel sheet sleeves.

END OF SECTION 220517

# SECTION 220518 - ESCUTCHEONS FOR PLUMBING PIPING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

### 1.3 ESCUTCHEONS

A. One-Piece, Steel Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped steel with polished, chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With polished, chrome-plated finish and spring-clip fasteners.

D. Split-Plate, Stamped-Steel Type: With polished, chrome-plated finish; concealed and exposed-rivet hinge; and spring-clip fasteners.

### 1.4 FLOOR PLATES

A. Split Floor Plates: Cast brass with concealed hinge.

## PART 2 - EXECUTION

### 2.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

1. Escutcheons for New Piping and Relocated Existing Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep pattern.
b. Chrome-Plated Piping: One-piece steel with polished, chrome-plated finish.
c. Insulated Piping: One-piece steel with polished, chrome-plated finish.
d. Insulated Piping: One-piece stamped steel or split-plate, stamped steel with concealed hinge or split-plate, stamped steel with exposed-rivet hinge with polished, chrome-plated finish.
e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece steel with polished, chrome-plated finish.
f. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece stamped steel or split-plate, stamped steel with concealed hinge or split-plate, stamped steel with exposed-rivet hinge with polished, chrome-plated finish.
g. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece steel with polished, chrome-plated finish.
h. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece stamped steel or split-plate, stamped steel with concealed hinge or split-plate, stamped steel with exposed-rivet hinge with polished, chrome-plated finish.

2. Escutcheons for Existing Piping to Remain:

a. Chrome-Plated Piping: Split-casting, stamped steel with concealed or exposed-rivet hinge with polished, chrome-plated finish.
b. Insulated Piping: Split-plate, stamped steel with concealed or exposed-rivet hinge with polished, chrome-plated finish
c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped steel with concealed or exposed-rivet hinge with polished, chrome-plated finish.
d. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped steel with concealed or exposed-rivet hinge with polished, chrome-plated finish.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping and Relocated Existing Piping: Split floor plate.
2. Existing Piping: Split floor plate.

## 2.2 FIELD QUALITY CONTROL

A. Using new materials, replace broken and damaged escutcheons and floor plates.

END OF SECTION 220518

# SECTION 220519 - METERS AND GAGES FOR PLUMBING PIPING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:

1. Bimetallic-actuated thermometers.
2. Liquid-in-glass thermometers.
3. Thermowells.
4. Dial-type pressure gages.
5. Gage attachments.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

### 1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of meter and gage.

### 1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

## PART 2 - PRODUCTS

### 2.1 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Compact-Style, Liquid-in-Glass Thermometers:
1. Standard: ASME B40.200.
2. Case: Cast aluminum; 6-inch nominal size.
3. Case Form: Back angle unless otherwise indicated.
4. Tube: Glass with magnifying lens and blue or red organic liquid.

5. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
6. Window: Glass or plastic.
7. Stem: Aluminum or brass and of length to suit installation.

    a. Design for Thermowell Installation: Bare stem.

8. Connector: 3/4 inch, with ASME B1.1 screw threads.
9. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

B. Plastic-Case, Compact-Style, Liquid-in-Glass Thermometers:
1. Standard: ASME B40.200.
2. Case: Plastic; 6-inch nominal size.
3. Case Form: Back angle unless otherwise indicated.
4. Tube: Glass with magnifying lens and blue or red organic liquid.
5. Tube Background: Nonreflective with permanently etched scale markings graduated in deg F.
6. Window: Glass or plastic.
7. Stem: Aluminum or brass and of length to suit installation.

    a. Design for Thermowell Installation: Bare stem.

8. Connector: 3/4 inch, with ASME B1.1 screw threads.
9. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

C. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:
1. Standard: ASME B40.200.
2. Case: Cast aluminum; 7-inch nominal size unless otherwise indicated.
3. Case Form: Adjustable angle unless otherwise indicated.
4. Tube: Glass with magnifying lens and blue or red organic liquid.
5. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
6. Window: Glass or plastic.
7. Stem: Aluminum and of length to suit installation.

    a. Design for Thermowell Installation: Bare stem.

8. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
9. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

D. Plastic-Case, Industrial-Style, Liquid-in-Glass Thermometers:

1.
2. Standard: ASME B40.200.
3. Case: Plastic; 7-inch nominal size unless otherwise indicated.
4. Case Form: Adjustable angle unless otherwise indicated.
5. Tube: Glass with magnifying lens and blue or red organic liquid.

6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F.
7. Window: Glass or plastic.
8. Stem: Aluminum and of length to suit installation.

    a. Design for Thermowell Installation: Bare stem.

9. Connector: 1-1/4 inches, with ASME B1.1 screw threads.
10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

## 2.2 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: CNR or CUNI.
4. Material for Use with Steel Piping: CRES.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch, with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

## 2.3 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:
1. Standard: ASME B40.100.
2. Case: Liquid-filled type(s);; 4-1/2-inch nominal diameter.
3. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
4. Pressure Connection: Brass, with NPS 1/4, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
5. Movement: Mechanical, with link to pressure element and connection to pointer.
6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
7. Pointer: Dark-colored metal.
8. Window: Glass or plastic.
9. Ring: Stainless steel.
10. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

B. Direct-Mounted, Plastic-Case, Dial-Type Pressure Gages:

1. Standard: ASME B40.100.
2. Case: Sealed type; plastic; 4-1/2-inch nominal diameter.
3. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
4. Pressure Connection: Brass, with NPS 1/4, ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
5. Movement: Mechanical, with link to pressure element and connection to pointer.
6. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi.
7. Pointer: Dark-colored metal.
8. Window: Glass or plastic.
9. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

2.4 GAGE ATTACHMENTS

A. Snubbers: ASME B40.100, brass; with NPS 1/4, ASME B1.20.1 pipe threads and piston-type surge-dampening device. Include extension for use on insulated piping.

B. Valves: Brass or stainless-steel needle, with NPS 1/4, ASME B1.20.1 pipe threads.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending a minimum of 2 inches into fluid and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.

G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

H. Install remote-mounted pressure gages on panel.

I. Install valve and snubber in piping for each pressure gage for fluids.

J. Install thermometers in the following locations:

1. Inlet and outlet of each water heater.
2. Inlets and outlets of each domestic water heat exchanger.
3. Inlet and outlet of each domestic hot-water storage tank.
4. Inlet and outlet of each remote domestic water chiller.
5.

K. Install pressure gages in the following locations:

1. Building water service entrance into building.
2. Inlet and outlet of each pressure-reducing valve.
3. Suction and discharge of each domestic water pump.
4.

L. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

M. Adjust faces of meters and gages to proper angle for best visibility.

## 3.2 THERMOMETER SCHEDULE

A. Thermometers at outlet of each domestic water heater shall be one of the following:

1. Liquid-filled, bimetallic-actuated type.
2. Metal case, compact industrial-style, liquid-in-glass type.

B. Thermometer stems shall be of length to match thermowell insertion length.

## 3.3 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Domestic Hot-Water Piping: 0 to 250 deg F.

## 3.4 PRESSURE-GAGE SCHEDULE

A. Pressure gages at discharge of each water service into building shall be the following:

1. Liquid-filled,-mounted, metal case.
2.

B. Pressure gages at inlet and outlet of each water pressure-reducing valve shall be the following:

1. Liquid-filled, direct-mounted, metal case.

C. Pressure gages at suction and discharge of each domestic water pump shall be the following:

1. Liquid-filled, direct-mounted, metal case.

3.5 PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Scale Range for Water Service Piping: 0 to 100 psi.

B. Scale Range for Domestic Water Piping: 0 to 100 psi.

END OF SECTION 220519

# SECTION 220523.12 - BALL VALVES FOR PLUMBING PIPING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Brass ball valves.
2. Bronze ball valves.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of valve.

1. Certification that products comply with NSF 61 Annex G and NSF 372.

## PART 2 - PRODUCTS

### 2.1 GENERAL REQUIREMENTS FOR VALVES

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance:

1. ASME B1.20.1 for threads for threaded end valves.
2. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
3. ASME B16.18 for solder-joint connections.
4. ASME B31.9 for building services piping valves.

C. NSF Compliance: NSF 61 Annex G and NSF 372 for valve materials for potable-water service.

D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.

E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

F. Valve Sizes: Same as upstream piping unless otherwise indicated.

G. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 4 and larger.
2. Handlever: For quarter-turn valves smaller than NPS 4.

H. Valves in Insulated Piping:

1. Include 2-inch stem extensions.
2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
3. Memory stops that are fully adjustable after insulation is applied.

## 2.2 BRASS BALL VALVES

A. Brass Ball Valves, One-Piece:

1. Description:

a. Standard: MSS SP-110.
b. CWP Rating: 400 psig.
c. Body Design: One piece.
d. Body Material: Forged brass or bronze.
e. Ends: Threaded and soldered.
f. Seats: PTFE.
g. Stem: Brass or stainless steel.
h. Ball: Chrome-plated brass or stainless steel.
i. Port: Reduced.

B. Brass Ball Valves, Two-Piece with Full Port and Brass Trim:

1. Description:

a. Standard: MSS SP-110.
b. CWP Rating: 600 psig.
c. Body Design: Two piece.
d. Body Material: Forged brass.
e. Ends: Threaded and soldered.
f. Seats: PTFE.
g. Stem: Brass.
h. Ball: Chrome-plated brass.
i. Port: Full.

C. Brass Ball Valves, Two-Piece with Regular Port and Brass Trim: Not Allowed

## 2.3 BRONZE BALL VALVES

A. Bronze Ball Valves, One-Piece:

1. Description:

a. Standard: MSS SP-110.
b. CWP Rating: 400 psig.
c. Body Design: One piece.
d. Body Material: Bronze.
e. Ends: Threaded.
f. Seats: PTFE.
g. Stem: Bronze.
h. Ball: Chrome-plated brass.
i. Port: Reduced.

B. Bronze Ball Valves, Two-Piece with Full Port, and Bronze or Brass Trim:

1. Description:

a. Standard: MSS SP-110.
b. CWP Rating: 600 psig.
c. Body Design: Two piece.
d. Body Material: Bronze.
e. Ends: Threaded and soldered.
f. Seats: PTFE.
g. Stem: Bronze or brass.
h. Ball: Chrome-plated brass.
i. Port: Full.

C. Bronze Ball Valves, Two-Piece with Regular Port and Bronze or Brass Trim: Not Allowed

## PART 3 - EXECUTION

### 3.1 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

### 3.2 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.

B. Select valves with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Steel Piping, NPS 2 and Smaller: Threaded ends.

## 3.3 LOW-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE (150 PSIG OR LESS)

A. Pipe NPS 2 and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Brass ball valves, one piece.
3. Bronze ball valve, one piece with bronze trim.
4. Brass ball valves, two-piece with full port and brass trim.
5. Bronze ball valves, two-piece with full port and bronze or brass trim.

## 3.4 HIGH-PRESSURE, COMPRESSED-AIR VALVE SCHEDULE (150 TO 200 PSIG

A. Pipe NPS 2 and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Brass ball valve, one piece.
3. Bronze ball valve with bronze trim, one piece.
4. Brass ball valves, two-piece with full port and brass trim.
5. Bronze ball valves, two-piece with full port and bronze or brass trim.

## 3.5 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Brass ball valve, one piece.
3. Bronze ball valve, one piece with bronze trim.
4. Brass ball valves, two-piece with full port and brass trim.
5. Bronze ball valves, two-piece with full port and bronze or brass trim.

END OF SECTION 220523.12

# SECTION 220529 - HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Metal pipe hangers and supports.
2. Trapeze pipe hangers.
3. Thermal-hanger shield inserts.
4. Fastener systems.
5. Pipe positioning systems.
6. Equipment supports.

### 1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.

1. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
3. Design seismic-restraint hangers and supports for piping and equipment as required for the project.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details and include calculations for the following; include Product Data for components:

1. Trapeze pipe hangers.
2. Equipment supports.

### 1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1.5 QUALITY ASSURANCE

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

B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

PART 2 - PRODUCTS

2.1 METAL PIPE HANGERS AND SUPPORTS

A. Carbon-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Galvanized Metallic Coatings: Pregalvanized or hot dipped.
3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

B. Stainless-Steel Pipe Hangers and Supports:

1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
2. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
3. Hanger Rods: Continuous-thread rod, nuts, and washer made of stainless steel.

C. Copper Pipe Hangers:

1. Description: MSS SP-58, Types 1 through 58, copper-coated-steel, factory-fabricated components.
2. Hanger Rods: Continuous-thread rod, nuts, and washer made of copper-coated steel.

2.2 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural carbon-steel shapes with MSS SP-58 carbon-steel hanger rods, nuts, saddles, and U-bolts.

2.3 THERMAL-HANGER SHIELD INSERTS

A. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength and vapor barrier.

B. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass with 100-psig minimum compressive strength.

C. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

D. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

E. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.

## 2.4 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

## 2.5 PIPE POSITIONING SYSTEMS

A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

## 2.6 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

## 2.7 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Nonstaining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi, 28-day compressive strength.

## PART 3 - EXECUTION

### 3.1 HANGER AND SUPPORT INSTALLATION

A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.

B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.

C. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

D. Fastener System Installation:

1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

E. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.

F. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.

M. Insulated Piping:

1. Attach clamps and spacers to piping.

    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.

    a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.

4. Shield Dimensions for Pipe: Not less than the following:

    a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
    b. NPS 4: 12 inches long and 0.06 inch thick.
    c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
    d. NPS 8 to NPS 14: 24 inches long and 0.075 inch thick.
    e. NPS 16 to NPS 24: 24 inches long and 0.105 inch thick.

5. Pipes NPS 8 and Larger: Include wood or reinforced calcium-silicate-insulation inserts of length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

## 3.2 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make bearing surface smooth.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

## 3.3 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

## 3.4 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches.

## 3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.

B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

## 3.6 HANGER AND SUPPORT SCHEDULE

A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use carbon-steel pipe hangers and supports and metal trapeze pipe hangers and attachments for general service applications.

F. Use stainless-steel pipe hangers and stainless-steel or corrosion-resistant attachments for hostile environment applications.

G. Use copper-plated pipe hangers and copper or stainless-steel attachments for copper piping and tubing.

H. Use padded hangers for piping that is subject to scratching.

I. Use thermal-hanger shield inserts for insulated piping and tubing.

J. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30.
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of up to 1050 deg F, pipes NPS 4 to NPS 24, requiring up to 4 inches of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36, requiring clamp flexibility and up to 4 inches of insulation.
4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8.
5. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30.
6. Pipe Saddle Supports (MSS Type 36): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate.
7. Pipe Stanchion Saddles (MSS Type 37): For support of pipes NPS 4 to NPS 36, with steel-pipe base stanchion support and cast-iron floor flange or carbon-steel plate, and with U-bolt to retain pipe.
8. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30, from two rods if longitudinal movement caused by expansion and contraction might occur.
9. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

K. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24.

2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 if longer ends are required for riser clamps.

L. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.

M. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction, to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb.
    b. Medium (MSS Type 32): 1500 lb.
    c. Heavy (MSS Type 33): 3000 lb.

8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

N. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

O. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.

2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41, roll hanger with springs.
3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to allow expansion and contraction of piping system from base support.

P. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.

Q. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.

R. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

END OF SECTION 220529

# SECTION 220553 - IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

## PART 2 - PRODUCTS

### 2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Brass, 0.032-inch stainless steel, 0.025-inch aluminum, 0.032-inch or anodized aluminum, 0.032-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.
4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
6. Fasteners: Stainless-steel rivets or self-tapping screws.
7. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), and the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number, and identify Drawing numbers where equipment is indicated (plans, details, and schedules) and the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

## 2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: White.

C. Background Color: Red.

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-quarters the size of principal lettering.

G. Fasteners: Stainless-steel rivets or self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information plus emergency notification instructions.

## 2.3 PIPE LABELS

A.

B. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

C. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.

D. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

E. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings; also include pipe size and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping-system service lettering to accommodate both directions or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: Size letters according to ASME A13.1 for piping.

## PART 3 - EXECUTION

### 3.1 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

### 3.2 PIPE LABEL INSTALLATION

A. Pipe Label Locations: Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations and on both sides of through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:

1. Low-Pressure Compressed Air Piping:

a. Background: Safety blue.
b. Letter Colors: White.

2. High-Pressure Compressed Air Piping:

a. Background: Safety blue.
b. Letter Colors: White.

3. Domestic Water Piping

a. Background: Safety green.
b. Letter Colors: White.

4. Sanitary Waste and Storm Drainage Piping:

a. Background Color: Safety black.
b. Letter Color: White.

END OF SECTION 220553

# SECTION 221116 - DOMESTIC WATER PIPING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Copper tube and fittings.
2. Ductile-iron pipe and fittings.
3. Galvanized steel pipe and fittings.
4. CPVC piping.
5. PEX tube and fittings.
6. PVC pipe and fittings.
7. PP pipe and fittings.
8. Piping joining materials.
9. Transition fittings.
10. Dielectric fittings.

### 1.2 ACTION SUBMITTALS

A. Product Data: For transition fittings and dielectric fittings.

### 1.3 INFORMATIONAL SUBMITTALS

A. System purging and disinfecting activities report.

B. Field quality-control reports.

## PART 2 - PRODUCTS

### 2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

B. Potable-water piping and components shall comply with NSF 14 and NSF 61 Annex G. Plastic piping components shall be marked with "NSF-pw."

C. Comply with NSF 372 for low lead.

## 2.2 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.

B. Soft Copper Tube: ASTM B 88, Type K and ASTM B 88, Type L water tube, annealed temper.

C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.

D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

E. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.

F. Copper Unions:

1. MSS SP-123.
2. Cast-copper-alloy, hexagonal-stock body.
3. Ball-and-socket, metal-to-metal seating surfaces.
4. Solder-joint or threaded ends.

G. Copper Pressure-Seal-Joint Fittings:

1. Fittings for NPS 2 and Smaller: Wrought-copper fitting with EPDM-rubber, O-ring seal in each end.
2. Fittings for NPS 2-1/2 to NPS 4: Cast-bronze or wrought-copper fitting with EPDM-rubber, O-ring seal in each end.

H. Copper Push-on-Joint Fittings:

1. Cast-copper fitting complying with ASME B16.18 or wrought-copper fitting complying with ASME B 16.22.
2. Stainless-steel teeth and EPDM-rubber, O-ring seal in each end instead of solder-joint ends.

## 2.3 DUCTILE-IRON PIPE AND FITTINGS

A. Mechanical-Joint, Ductile-Iron Pipe:

1. AWWA C151/A21.51, with mechanical-joint bell and plain spigot end unless grooved or flanged ends are indicated.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

B. Standard-Pattern, Mechanical-Joint Fittings:

1. AWWA C110/A21.10, ductile or gray iron.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

C. Compact-Pattern, Mechanical-Joint Fittings:

1. AWWA C153/A21.53, ductile iron.
2. Glands, Gaskets, and Bolts: AWWA C111/A21.11, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

## 2.4 GALVANIZED-STEEL PIPE AND FITTINGS

A. Galvanized-Steel Pipe:

1. ASTM A 53/A 53M, Type E, Grade B, Standard Weight.
2. Include ends matching joining method.

B. Galvanized-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M or ASTM A 106/A 106M, Standard Weight, seamless steel pipe with threaded ends.

C. Galvanized, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

D. Malleable-Iron Unions:

1. ASME B16.39, Class 150.
2. Hexagonal-stock body.
3. Ball-and-socket, metal-to-metal, bronze seating surface.
4. Threaded ends.

E. Flanges: ASME B16.1, Class 125, cast iron.

## 2.5 CPVC PIPING

A. CPVC Pipe: ASTM F 441/F 441M, Schedule 40 and Schedule 80.

1. CPVC Socket Fittings: ASTM F 438 for Schedule 40 and ASTM F 439 for Schedule 80.
2. CPVC Threaded Fittings: ASTM F 437, Schedule 80.

B. CPVC Piping System: ASTM D 2846/D 2846M, SDR 11, pipe and socket fittings.

C. CPVC Tubing System: ASTM D 2846/D 2846M, SDR 11, tube and socket fittings.

## 2.6 PVC PIPE AND FITTINGS

A. PVC Pipe: ASTM D 1785, Schedule 40 and Schedule 80.

B. PVC Socket Fittings: ASTM D 2466 for Schedule 40 and ASTM D 2467 for Schedule 80.

C. PVC Schedule 80 Threaded Fittings: ASTM D 2464.

## 2.7 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials:

1. AWWA C110/A21.10, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free unless otherwise indicated.
2. Full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys.

D. Flux: ASTM B 813, water flushable.

E. Brazing Filler Metals: AWS A5.8M/A5.8, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

F. Solvent Cements for Joining CPVC Piping and Tubing: ASTM F 493.

G. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

H. Plastic, Pipe-Flange Gaskets, Bolts, and Nuts: Type and material recommended by piping system manufacturer unless otherwise indicated.

## 2.8 TRANSITION FITTINGS

A. General Requirements:

1. Same size as pipes to be joined.
2. Pressure rating at least equal to pipes to be joined.
3. End connections compatible with pipes to be joined.

B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.

C. Plastic-to-Metal Transition Fittings:

a. CPVC or PVC one-piece fitting with manufacturer's Schedule 80 equivalent dimensions.
b. One end with threaded brass insert and one solvent-cement-socket or threaded end.

D. Plastic-to-Metal Transition Unions:
1. Description:

a. CPVC or PVC four-part union.
b. Brass or stainless-steel threaded end.

c. Solvent-cement-joint or threaded plastic end.
d. Rubber O-ring.
e. Union nut.

2.9 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.

B. Dielectric Unions:
1. Standard: ASSE 1079.
2. Pressure Rating: 125 psig minimum at 180 deg F 150 psig 250 psig Insert value.
3. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:
1. Standard: ASSE 1079.
2. Factory-fabricated, bolted, companion-flange assembly.
3. Pressure Rating: 125 psig minimum at 180 deg F.
4. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

D. Dielectric-Flange Insulating Kits:
1. Nonconducting materials for field assembly of companion flanges.
2. Pressure Rating: 150 psig.
3. Gasket: Neoprene or phenolic.
4. Bolt Sleeves: Phenolic or polyethylene.
5. Washers: Phenolic with steel backing washers.

E. Dielectric Nipples:
1. Standard: IAPMO PS 66.
2. Electroplated steel nipple complying with ASTM F 1545.
3. Pressure Rating and Temperature: 300 psig at 225 deg F.
4. End Connections: Male threaded or grooved.
5. Lining: Inert and noncorrosive, propylene.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements in Section 312000 "Earth Moving" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and

calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.

D. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 221119 "Domestic Water Piping Specialties."

E. Install shutoff valve immediately upstream of each dielectric fitting.

F. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 221119 "Domestic Water Piping Specialties."

G. Install domestic water piping level and plumb.

H. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

I. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

J. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

K. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

L. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.

M. Install piping to permit valve servicing.

N. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.

O. Install piping free of sags and bends.

P. Install fittings for changes in direction and branch connections.

Q. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

R. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Section 220519 "Meters and Gages for Plumbing Piping."

S. Install thermostats in hot-water circulation piping. Comply with requirements for thermostats in Section 221123 "Domestic Water Pumps."

T. Install thermometers on outlet piping from each water heater. Comply with requirements for thermometers in Section 220519 "Meters and Gages for Plumbing Piping."

U. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

V. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

W. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

## 3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Brazed Joints" chapter.

E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Pressure-Sealed Joints for Copper Tubing: Join copper tube and pressure-seal fittings with tools recommended by fitting manufacturer.

G. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

H. Joint Construction for Solvent-Cemented Plastic Piping: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
3. PVC Piping: Join according to ASTM D 2855.

I. Joints for PEX Tubing: Join according to ASTM F 1807 for metal insert and copper crimp ring fittings and ASTM F 1960 for cold expansion fittings and reinforcing rings.

J. Joints for PEX Tubing: Join according to ASSE 1061 for push-fit fittings.

K. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

## 3.4 TRANSITION FITTING INSTALLATION

A. Install transition couplings at joints of dissimilar piping.

B. Transition Fittings in Underground Domestic Water Piping:

1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
2. Fittings for NPS 2 and Larger: Sleeve-type coupling.

C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

## 3.5 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric flanges.

D. Dielectric Fittings for NPS 5 and Larger: Use dielectric flange kits.

## 3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for seismic-restraint devices in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment."

B. Comply with requirements for pipe hanger, support products, and installation in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.

E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
4. NPS 2-1/2: 108 inches with 1/2-inch rod.
5. NPS 3 to NPS 5: 10 feet with 1/2-inch rod.
6. NPS 6: 10 feet with 5/8-inch rod.
7. NPS 8: 10 feet with 3/4-inch rod.

F. Install supports for vertical copper tubing every 10 feet.

G. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4 and Smaller: 84 inches with 3/8-inch rod.
2. NPS 1-1/2: 108 inches with 3/8-inch rod.
3. NPS 2: 10 feet with 3/8-inch rod.
4. NPS 2-1/2: 11 feet with 1/2-inch rod.
5. NPS 3 and NPS 3-1/2: 12 feet with 1/2-inch rod.
6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
7. NPS 6: 12 feet with 3/4-inch rod.
8. NPS 8 to NPS 12: 12 feet with 7/8-inch rod.

H. Install supports for vertical steel piping every 15 feet.

I. Install vinyl-coated hangers for CPVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1 and Smaller: 36 inches with 3/8-inch rod.
2. NPS 1-1/4 to NPS 2: 48 inches with 3/8-inch rod.

3. NPS 2-1/2 to NPS 3-1/2: 48 inches with 1/2-inch rod.
4. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
5. NPS 6: 48 inches with 3/4-inch rod.
6. NPS 8: 48 inches with 7/8-inch rod.

J. Install supports for vertical CPVC piping every 60 inches for NPS 1 and smaller, and every 72 inches for NPS 1-1/4 and larger.

K. Install vinyl-coated hangers for PEX tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1 and Smaller: 32 inches with 3/8-inch rod.

L. Install hangers for vertical PEX tubing every 48 inches.

M. Install vinyl-coated hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 2 and Smaller: 48 inches with 3/8-inch rod.
2. NPS 2-1/2 to NPS 3-1/2: 48 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
4. NPS 6: 48 inches with 3/4-inch rod.
5. NPS 8: 48 inches with 7/8-inch rod.

N. Install supports for vertical PVC piping every 48 inches.

O. Support piping and tubing not listed in this article according to MSS SP-58 and manufacturer's written instructions.

## 3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:

1. Domestic Water Booster Pumps: Cold-water suction and discharge piping.
2. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
3. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
4. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

## 3.8 IDENTIFICATION

A. Identify system components. Comply with requirements for identification materials and installation in Section 220553 "Identification for Plumbing Piping and Equipment."

B. Label pressure piping with system operating pressure.

## 3.9 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Piping Inspections:

   a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
   b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:

      1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
      2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.

   c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
   d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

2. Piping Tests:

   a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.
   b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
   c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
   d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
   e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
   f. Prepare reports for tests and for corrective action required.

B. Domestic water piping will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

## 3.10 ADJUSTING

A. Perform the following adjustments before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.

    a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
    b. Adjust calibrated balancing valves to flows indicated.

5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
8. Check plumbing specialties and verify proper settings, adjustments, and operation.

## 3.11 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

    a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    b. Fill and isolate system according to either of the following:

        1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
        2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.

    c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    d. Repeat procedures if biological examination shows contamination.

e. Submit water samples in sterile bottles to authorities having jurisdiction.

B. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

## 3.12 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.

C. Fitting Option: Extruded-tee connections and brazed joints may be used on aboveground copper tubing.

D. Under-building-slab, domestic water, building-service piping, NPS 3 and smaller, shall be the following:

1. Soft copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.

E. Under-building-slab, domestic water, building-service piping, NPS 4 to NPS 8 and larger, shall be one of the following:

1. Soft copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and brazed joints.
2. Plain-end, ductile-iron pipe; grooved-joint, ductile-iron-pipe appurtenances; and grooved joints.

F. Under-building-slab, combined domestic water, building-service, and fire-service-main piping, NPS 6 to NPS 12, shall be the following:

1. Plain-end, ductile-iron pipe; grooved-joint, ductile-iron-pipe appurtenances; and grooved joints.

G. Under-building-slab, domestic water piping, NPS 2 and smaller, shall be the following:

1. Hard or soft copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings

H. Aboveground domestic water piping, NPS 2 and smaller, shall be the following:

1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and brazed soldered joints.

I. Aboveground domestic water piping, NPS 2-1/2 to NPS 4, shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and brazed joints.
2. Hard copper tube, ASTM B 88, Type L; grooved-joint, copper-tube appurtenances; and grooved joints.

J. Aboveground domestic water piping, NPS 5 to NPS 8, shall be one of the following:

1. Hard copper tube, ASTM B 88, Type L; cast- or wrought-copper, solder-joint fittings; and brazed joints.
2. Hard copper tube, [**ASTM B 88, Type L**] [**or**] [**ASTM B 88, Type M**]; grooved-joint, copper-tube appurtenances; and grooved joints.

K. Aboveground, combined domestic water-service and fire-service-main piping, NPS 6 to NPS 12, shall be the following:

1. Plain-end, ductile-iron pipe; grooved-joint, ductile-iron-pipe appurtenances; and grooved joints.

END OF SECTION 221116

# SECTION 221119 - DOMESTIC WATER PIPING SPECIALTIES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Vacuum breakers.
2. Backflow preventers.
3. Water pressure-reducing valves.
4. Balancing valves.
5. Temperature-actuated, water mixing valves.
6. Strainers.
7. Hose bibbs.
8. Wall hydrants.
9. Drain valves.
10. Water-hammer arresters.
11. Trap-seal primer valves.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

### 1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

### 1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

## PART 2 - PRODUCTS

### 2.1 GENERAL REQUIREMENTS FOR PIPING SPECIALTIES

A. Potable-water piping and components shall comply with NSF 61 Annex G and NSF 14.

### 2.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig unless otherwise indicated.

## 2.3 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

1. Standard: ASSE 1001.
2. Size: NPS 1/4 to NPS 3, as required to match connected piping.
3. Body: Bronze.
4. Inlet and Outlet Connections: Threaded.
5. Finish: Rough bronze.

B. Hose-Connection Vacuum Breakers:

1. Standard: ASSE 1011.
2. Body: Bronze, nonremovable, with manual drain.
3. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
4. Finish: Rough bronze.

## 2.4 BACKFLOW PREVENTERS

A. Intermediate Atmospheric-Vent Backflow Preventers:

1. Standard: ASSE 1012.
2. Operation: Continuous-pressure applications.
3. Size: NPS 1/2.
4. Body: Bronze.
5. End Connections: Union, solder joint.
6. Finish: Rough bronze.

B. Reduced-Pressure-Principle Backflow Preventers:

1. Standard: ASSE 1013.
2. Operation: Continuous-pressure applications.
3. Pressure Loss: 12 psig maximum, through middle third of flow range.
4. Size: Reference Plumbing Plans.
5. Design Flow Rate: Reference Plumbing Plans.
6. Body: Bronze for NPS 2 and smaller; stainless steel for NPS 2-1/2 and larger.
7. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
8. Configuration: Designed for horizontal, straight-through flow.
9. Accessories:

    a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
    b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.
    c. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.

C. Double-Check, Backflow-Prevention Assemblies:

1. Standard: ASSE 1015.
2. Operation: Continuous-pressure applications unless otherwise indicated.

3. Pressure Loss: 5 psig maximum, through middle third of flow range.
4. Size: Reference Fire Sprinkler Plans.
5. Design Flow Rate: Reference Fire Sprinkler Plans.
6. Body: Bronze for NPS 2 and smaller; stainless steel for NPS 2-1/2 and larger.
7. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
8. Configuration: Designed for horizontal, straight-through flow.
9. Accessories:

    a. Valves NPS 2 and Smaller: Ball type with threaded ends on inlet and outlet.
    b. Valves NPS 2-1/2 and Larger: Outside-screw and yoke-gate type with flanged ends on inlet and outlet.

## 2.5 WATER PRESSURE-REDUCING VALVES

A. Water Regulators:

1. Standard: ASSE 1003.
2. Pressure Rating: Initial working pressure of 150 psig.
3. Size: Reference Domestic Water Plans.
4. Design Flow Rate: Reference Domestic Water Plans.
5. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved for NPS 2-1/2 and NPS 3.
6. Valves for Booster Heater Water Supply: Include integral bypass.
7. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and NPS 3.

## 2.6 BALANCING VALVES

A. Memory-Stop Balancing Valves:

1. Standard: MSS SP-110 for two-piece, copper-alloy ball valves.
2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 2 or smaller.
4. Body: Copper alloy.
5. Port: Standard or full port.
6. Ball: Chrome-plated brass.
7. Seats and Seals: Replaceable.
8. End Connections: Solder joint or threaded.
9. Handle: Vinyl-covered steel with memory-setting device.

## 2.7 TEMPERATURE-ACTUATED, WATER MIXING VALVES

A. Water-Temperature Limiting Devices:

1. Standard: ASSE 1017.
2. Pressure Rating: 125 psig.

3. Type: Thermostatically controlled, water mixing valve.
4. Material: Bronze body with corrosion-resistant interior components.
5. Connections: Threaded inlets and outlet.
6. Accessories: Check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
7. Tempered-Water Setting: 110F.
8. Tempered-Water Design Flow Rate: Reference Domestic Water Plans.
9. Valve Finish: Rough bronze.

B. Primary, Thermostatic, Water Mixing Valves:

1. Standard: ASSE 1017.
2. Pressure Rating: 125 psig minimum unless otherwise indicated.
3. Type: Exposed-mounted, thermostatically controlled, water mixing valve.
4. Material: Bronze body with corrosion-resistant interior components.
5. Connections: Threaded inlets and outlet.
6. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
7. Tempered-Water Setting: 110F.
8. Tempered-Water Design Flow Rate: Reference Domestic Water Plan.
9. Valve Finish: Rough bronze.
10. Piping Finish: Copper.
11. Cabinet: Factory fabricated, stainless steel, for surface mounting and with hinged, stainless-steel door.

## 2.8 STRAINERS FOR DOMESTIC WATER PIPING

A. Y-Pattern Strainers:

1. Pressure Rating: 125 psig minimum unless otherwise indicated.
2. Body: Bronze for NPS 2 and smaller; cast iron with interior lining that complies with AWWA C550 or that is FDA approved, epoxy coated and for NPS 2-1/2 and larger.
3. End Connections: Threaded for NPS 2 and smaller; flanged for NPS 2-1/2 and larger.
4. Screen: Stainless steel with round perforations unless otherwise indicated.
5. Perforation Size:

    a. Strainers NPS 2 and Smaller: 0.020 inch.
    b. Strainers NPS 2-1/2 to NPS 4: 0.045 inch.
    c. Strainers NPS 5 and Larger: 0.10 inch.

6. Drain: Factory-installed, hose-end drain valve.

## 2.9 HOSE BIBBS

A. Hose Bibbs:

1. Standard: ASME A112.18.1 for sediment faucets.
2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 1/2 or NPS 3/4 threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral or field-installation, nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Rough bronze.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Wheel handle.
13. Operation for Finished Rooms: Operating key.
14. Include operating key with each operating-key hose bibb.
15. Include integral wall flange with each chrome- or nickel-plated hose bibb.

## 2.10 WALL HYDRANTS

A. Nonfreeze Wall Hydrants:

1. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
2. Pressure Rating: 125 psig.
3. Operation: Loose key.
4. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
5. Inlet: NPS 3/4 or NPS 1.
6. Outlet: Concealed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
7. Box: Deep, flush mounted with cover.
8. Box and Cover Finish: Polished nickel bronze.
9. Outlet: Exposed, with integral vacuum breaker and garden-hose thread complying with ASME B1.20.7.
10. Nozzle and Wall-Plate Finish: Polished nickel bronze.
11. Operating Keys(s): One with each wall hydrant.

B. Nonfreeze, Hot- and Cold-Water Wall Hydrants:

1. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
2. Pressure Rating: 125 psig.
3. Operation: Loose key.
4. Casing and Operating Rods: Of length required to match wall thickness. Include wall clamps.
5. Inlet: NPS 3/4 or NPS 1.
6. Outlet: Concealed.
7. Box: Deep, flush mounted with cover.
8. Box and Cover Finish: Polished nickel bronze.
9. Vacuum Breaker:

a. Nonremovable, manual-drain-type, hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.
b. Garden-hose thread complying with ASME B1.20.7 on outlet.

10. Operating Keys(s): One with each wall hydrant.

C. Moderate-Climate Wall Hydrants:

1. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
2. Pressure Rating: 125 psig.
3. Operation: Loose key.
4. Inlet: NPS 3/4 or NPS 1.
5. Outlet:

a. Concealed, with integral vacuum breaker or nonremovable hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.
b. Garden-hose thread complying with ASME B1.20.7.

6. Box: Deep, flush mounted with cover.
7. Box and Cover Finish: Polished nickel bronze.
8. Outlet:

a. Concealed, with integral vacuum breaker or nonremovable hose-connection vacuum breaker complying with ASSE 1011 or backflow preventer complying with ASSE 1052.
b. Garden-hose thread complying with ASME B1.20.7.

9. Nozzle and Wall-Plate Finish: Polished nickel bronze.
10. Operating Keys(s): One with each wall hydrant.

D. Vacuum Breaker Wall Hydrants:

1. Standard: ASSE 1019, Type A or Type B.
2. Type: Freeze-resistant, automatic draining with integral air-inlet valve.
3. Classification: Type A, for automatic draining with hose removed or Type B, for automatic draining with hose removed or with hose attached and nozzle closed.
4. Pressure Rating: 125 psig.
5. Operation: Loose key or wheel handle.
6. Casing and Operating Rod: Of length required to match wall thickness. Include wall clamp.
7. Inlet: NPS 1/2 or NPS 3/4.
8. Outlet: Exposed with garden-hose thread complying with ASME B1.20.7.

## 2.11 DRAIN VALVES

A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.

2. Pressure Rating: 400-psig minimum CWP.
3. Size: NPS 3/4.
4. Body: Copper alloy.
5. Ball: Chrome-plated brass.
6. Seats and Seals: Replaceable.
7. Handle: Vinyl-covered steel.
8. Inlet: Threaded or solder joint.
9. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

## 2.12 WATER-HAMMER ARRESTERS

A. Water-Hammer Arresters:

1. Standard: ASSE 1010 or PDI-WH 201.
2. Type: Copper tube with piston.
3. Size: ASSE 1010, Sizes AA and A through F, or PDI-WH 201, Sizes A through F.

## 2.13 TRAP-SEAL PRIMER DEVICE

A. Supply-Type, Trap-Seal Primer Device:

1. Standard: ASSE 1018.
2. Pressure Rating: 125 psig minimum.
3. Body: Bronze.
4. Inlet and Outlet Connections: NPS 1/2 threaded, union, or solder joint.
5. Gravity Drain Outlet Connection: NPS 1/2 threaded or solder joint.
6. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

B. Drainage-Type, Trap-Seal Primer Device:

1. Standard: ASSE 1044, lavatory P-trap with NPS 3/8 minimum, trap makeup connection.
2. Size: NPS 1-1/4 minimum.
3. Material: Chrome-plated, cast brass.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

A. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.

2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe-to-floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are unacceptable for this application.
3. Do not install bypass piping around backflow preventers.

B. Install water regulators with inlet and outlet shutoff valves and bypass with memory-stop balancing valve. Install pressure gages on inlet and outlet.

C. Install balancing valves in locations where they can easily be adjusted.

D. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

1. Install cabinet-type units recessed in or surface mounted on wall as specified.

E. Install Y-pattern strainers for water on supply side of each control valve water pressure-reducing valve solenoid valve and pump.

F. Set nonfreeze, nondraining-type post hydrants in concrete or pavement.

G. Set freeze-resistant yard hydrants with riser pipe in concrete or pavement. Do not encase canister in concrete.

H. Install water-hammer arresters in water piping according to PDI-WH 201.

I. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

J. Install drainage-type, trap-seal primer valves as lavatory trap with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting.

## 3.2 CONNECTIONS

A. Comply with requirements for ground equipment in Section 260526 "Grounding and Bonding for Electrical Systems."

B. Fire-retardant-treated-wood blocking is specified in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for electrical connections.

## 3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test each pressure vacuum breaker reduced-pressure-principle backflow preventer double-check, backflow-prevention assembly and double-check,

detector-assembly backflow preventer Insert type according to authorities having jurisdiction and the device's reference standard.

B. Domestic water piping specialties will be considered defective if they do not pass tests and inspections.

C. Prepare test and inspection reports.

3.4 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.

B. Set field-adjustable flow set points of balancing valves.

C. Set field-adjustable temperature set points of temperature-actuated, water mixing valves.

END OF SECTION 221119

# SECTION 221123.21 - INLINE, DOMESTIC-WATER PUMPS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. In-line, sealless centrifugal pumps.
2. Horizontally mounted, in-line, close-coupled centrifugal pumps.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

### 1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Detail pumps and adjacent equipment, drawn to scale and coordinated with each other, using input from installers of the items involved.

B. Field quality-control reports.

### 1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. UL Compliance: UL 778 for motor-operated water pumps.

C. Drinking Water System Components - Health Effects and Drinking Water System Components - Lead Content Compliance: NSF 61 and NSF 372.

## 2.2 IN-LINE, SEALLESS CENTRIFUGAL PUMPS

A. Description: Factory-assembled and -tested, in-line, close-coupled, canned-motor, sealless, overhung-impeller centrifugal pumps.

B. Capacities and Characteristics: Reference drawing schedule

C. Pump Construction:

1. Pump and Motor Assembly: Hermetically sealed, replaceable-cartridge type with motor and impeller on common shaft and designed for installation with pump and motor shaft horizontal.
2. Minimum Working Pressure: 125 psig.
3. Maximum Continuous Operating Temperature: 220 deg F.
4. Casing: Bronze, with threaded or companion-flange connections.
5. Impeller: Plastic composite or stainless steel.
6. Motor: variable speed.

## 2.3 HORIZONTALLY MOUNTED, IN-LINE, CLOSE-COUPLED CENTRIFUGAL PUMPS

A. Description: Factory-assembled and -tested, in-line, single-stage, close-coupled, overhung-impeller centrifugal pumps designed for installation with pump and motor shaft mounted horizontal.

B. Capacities and Characteristics: Reference drawing schedule

C. Pump Construction:

1. Casing:

   a. Radially split bronze with threaded companion-flange connections for pumps with NPS 2 pipe connections and flanged connections for pumps with NPS 2-1/2 pipe connections.
   b. Built to permit servicing of pump internals without disturbing the casing or the suction and discharge piping.
   c. Gauge port tappings at suction and discharge nozzles.

2. Impeller: or brass, statically and dynamically balanced, closed, and keyed to shaft.
3. Shaft and Shaft Sleeve: Steel shaft with deflector, with copper-alloy shaft sleeve. Include water slinger on shaft between motor and seal.
4. Shaft Coupling: Flexible, capable of absorbing torsional vibration and shaft misalignment.
5. Minimum Working Pressure: 175 psig.
6. Continuous Operating Temperature: 225 deg F.

D. Motor: Single speed or variable speed as specified on the drawings

## 2.4 MOTORS

A. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 220513 "Common Motor Requirements for Plumbing Equipment."

1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.

## 2.5 CONTROLS

A. Thermostats: Electric; adjustable for control of hot-water circulation pump.

1. Type: Water-immersion temperature sensor, for installation in piping.
2. Range: 65 to 200 deg F.
3. Enclosure: NEMA 250,.
4. Operation of Pump: On or off.
5. Transformer: Provide if required.
6. Power Requirement: 120 V ac.
7. Settings: Start pump at 115 deg F and stop pump at 120 deg F.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

A. Comply with HI 1.4.

B. Mount pumps in orientation complying with manufacturer's written instructions.

C. Install continuous-thread hanger rods and vibration isolation of size required to support pump weight.
1. Comply with requirements for hangers and supports specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

D. Install thermostats in hot-water return piping.

E. Identify system components. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment" for identification of pumps.

F. Perform startup service.

1. Complete installation and startup checks according to manufacturer's written instructions.
2. Check piping connections for tightness.
3. Clean strainers on suction piping.
4. Set thermostats and controls for automatic starting and stopping operation of pumps.

5. Perform the following startup checks for each pump before starting:

    a. Verify bearing lubrication.
    b. Verify that pump is free to rotate by hand and that pump for handling hot liquid is free to rotate with pump hot and cold. If pump is bound or drags, do not operate until cause of trouble is determined and corrected.
    c. Verify that pump is rotating in the correct direction.

6. Prime pump by opening suction valves and closing drains, and prepare pump for operation.
7. Start motor.
8. Open discharge valve slowly.
9. Adjust temperature settings on thermostats.
10. Adjust timer settings.

## 3.2 PIPING CONNECTIONS

A. Comply with requirements for piping specified in Section 221116 "Domestic Water Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

B. Where installing piping adjacent to inline, domestic-water pumps, allow space for service and maintenance.

C. Connect domestic-water piping to pumps. Install suction and discharge piping equal to or greater than size of pump nozzles.

1. Install flexible connectors adjacent to pumps in suction and discharge piping of the following pumps:

    a. Horizontally mounted, in-line, close-coupled centrifugal pumps.
    b. Comply with requirements for flexible connectors specified in Section 221116 "Domestic Water Piping."

D. Install shutoff valve and strainer on suction side of each pump, and check, shutoff, and throttling valves on discharge side of each pump. Install valves same size as connected piping. Comply with requirements for strainers specified in Section 221119 "Domestic Water Piping Specialties." Comply with requirements for valves specified in the following:

1. Section 220523.12 "Ball Valves for Plumbing Piping."
2. Section 220523.13 "Butterfly Valves for Plumbing Piping."
3. Section 220523.14 "Check Valves for Plumbing Piping."
4. Section 220523.15 "Gate Valves for Plumbing Piping."
5. Install pressure gauge at suction of each pump and pressure gauge at discharge of each pump. Install at integral pressure-gauge tappings where provided or install pressure-gauge connectors in suction and discharge piping around pumps. Comply with requirements for pressure gauges and snubbers specified in Section 220519 "Meters and Gages for Plumbing Piping."

## 3.3 CONTROL CONNECTIONS

A. Install control and electrical power wiring to field-mounted control devices.

B. Connect control wiring between temperature controllers and devices.

C. Interlock pump between water heater and hot-water storage tank with water heater burner and time-delay relay.

## 3.4 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

C. Perform tests and inspections with observation of the engineer of record for the project.

D. Tests and Inspections:

1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Inline, domestic-water pump will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

## 3.5 ADJUSTING

A. Adjust inline, domestic-water pumps to function smoothly, and lubricate as recommended by manufacturer.

B. Adjust initial temperature set points.

C. Set field-adjustable switches and circuit-breaker trip ranges as indicated.

END OF SECTION 221123.21

# SECTION 221316 - SANITARY WASTE AND VENT PIPING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Hubless, cast-iron soil pipe and fittings.
2. Copper tube and fittings.
3. PVC pipe and fittings.
4. Specialty pipe fittings.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

### 1.3 INFORMATIONAL SUBMITTALS

A. Seismic Qualification Certificates: For waste and vent piping, accessories, and components, from manufacturer.

B. Field quality-control reports.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water or as required by the jurisdiction whichever is greater.

B. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7 If in an earthquake zone.

### 2.2 PIPING MATERIALS

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

## 2.3 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings: ASTM A 888 or CISPI 301.

B. CISPI, Hubless-Piping Couplings:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. ANACO-Husky.
   b. Dallas Specialty & Mfg. Co.
   c. Fernco Inc.
   d. Matco-Norca, Inc.
   e. MIFAB, Inc.
   f. Mission Rubber Company; a division of MCP Industries, Inc.
   g. Stant.
   h. Tyler Pipe.

2. Standards: ASTM C 1277 and CISPI 310.
3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

## 2.4 COPPER TUBE AND FITTINGS

A. Copper Type DWV Tube: ASTM B 306, drainage tube, drawn temper.

B. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

C. Copper Pressure Fittings:

1. Copper Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.
2. Copper Unions: MSS SP-123, copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

D. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.

1. Flange Gasket Materials: ASME B16.21, full-face, flat, nonmetallic, asbestos-free, 1/8-inch maximum thickness unless thickness or specific material is indicated.
2. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

E. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.
1.

2.5 PVC PIPE AND FITTINGS

A. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

B. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.

C. Cellular-Core PVC Pipe: ASTM F 891, Schedule 40.

D. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

E. Adhesive Primer: ASTM F 656.

F. Solvent Cement: ASTM D 2564.

2.6 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
2. Unshielded, Nonpressure Transition Couplings:

a. Standard: ASTM C 1173.
b. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
c. End Connections: Same size as and compatible with pipes to be joined.
d. Sleeve Materials:

1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

3. Shielded, Nonpressure Transition Couplings:

a. Standard: ASTM C 1460.
b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
c. End Connections: Same size as and compatible with pipes to be joined.

## PART 3 - EXECUTION

### 3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

### 3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.

1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
2. Install piping as indicated unless deviations to layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 220548 "Vibration and Seismic Controls for Plumbing Piping and Equipment." If the project is located in an earthquake zone

K. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends.

1. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical.
2. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe.

a. Straight tees, elbows, and crosses may be used on vent lines.

3. Do not change direction of flow more than 90 degrees.
4. Use proper size of standard increasers and reducers if pipes of different sizes are connected.

a. Reducing size of waste piping in direction of flow is prohibited.

L. Lay buried building waste piping beginning at low point of each system.

1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
3. Maintain swab in piping and pull past each joint as completed.

M. Install soil and waste and vent piping at the following minimum slopes unless otherwise indicated:

1. Building Sanitary Waste: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Sanitary Waste Piping: 2 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

N. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

O. Install aboveground copper tubing according to CDA's "Copper Tube Handbook."

P. Install aboveground ABS piping according to ASTM D 2661.

Q. Install aboveground PVC piping according to ASTM D 2665.

R. Install underground PVC piping according to ASTM D 2321.

S. Plumbing Specialties:

1. Install backwater valves in sanitary waster gravity-flow piping.

a. Comply with requirements for backwater valves specified in Section 221319 "Sanitary Waste Piping Specialties."

2. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary waste gravity-flow piping.

a. Comply with requirements for cleanouts specified in Section 221319 "Sanitary Waste Piping Specialties."

3. Install drains in sanitary waste gravity-flow piping.

a. Comply with requirements for drains specified in Section 221319 "Sanitary Waste Piping Specialties."

T. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

U. Install sleeves for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

V. Install sleeve seals for piping penetrations of concrete walls and slabs.

1. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

W. Install escutcheons for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

## 3.3 JOINT CONSTRUCTION

A. Join hub-and-spigot, cast-iron soil piping with gasket joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for compression joints.

B. Join copper tube and fittings with soldered joints according to ASTM B 828. Use ASTM B 813, water-flushable, lead-free flux and ASTM B 32, lead-free-alloy solder.

C. Grooved Joints: Cut groove ends of pipe according to AWWA C606. Lubricate and install gasket over ends of pipes or pipe and fitting. Install coupling housing sections, over gasket, with keys seated in piping grooves. Install and tighten housing bolts.

D. Plastic, Nonpressure-Piping, Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 appendixes.
3. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 appendixes.

## 3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in ODs.

## 3.5 VALVE INSTALLATION

A. Comply with requirements in Section 220523.12 "Ball Valves for Plumbing Piping," Section 220523.13Shutoff Valves:

1. Install shutoff valve on each sewage pump discharge.
2. Install gate or full-port ball valve for piping NPS 2 and smaller.
3. Install gate valve for piping NPS 2-1/2 and larger.

B. Check Valves: Install swing check valve, between pump and shutoff valve, on each sewage pump discharge.

C. Backwater Valves: Install backwater valves in piping subject to backflow.

1. Horizontal Piping: Horizontal backwater valves. Use normally closed type unless otherwise indicated.
2. Floor Drains: Drain outlet backwater valves unless drain has integral backwater valve.
3. Install backwater valves in accessible locations.
4. Comply with requirements for backwater valve specified in Section 221319 "Sanitary Waste Piping Specialties."

## 3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install stainless-steel or fiberglass pipe hangers for horizontal piping in corrosive environments.
3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
5. Vertical Piping: MSS Type 8 or Type 42, clamps.
6. Install individual, straight, horizontal piping runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
8. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
5. NPS 10 and NPS 12: 60 inches with 7/8-inch rod.
6. Spacing for 10-foot lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

F. Install supports for vertical cast-iron soil piping every 15 feet.

G. Install hangers for steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 84 inches with 3/8-inch rod.
2. NPS 1-1/2: 108 inches with 3/8-inch rod.
3. NPS 2: 10 feet with 3/8-inch rod.
4. NPS 2-1/2: 11 feet with 1/2-inch rod.
5. NPS 3: 12 feet with 1/2-inch rod.
6. NPS 4 and NPS 5: 12 feet with 5/8-inch rod.
7. NPS 6 and NPS 8: 12 feet with 3/4-inch rod.
8. NPS 10 and NPS 12: 12 feet with 7/8-inch rod.

H. Install supports for vertical steel piping every 15 feet.

I. Install hangers for stainless-steel piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 2: 84 inches with 3/8-inch rod.
2. NPS 3: 96 inches with 1/2-inch rod.
3. NPS 4: 108 inches with 1/2-inch rod.
4. NPS 6: 10 feet with 5/8-inch rod.

J. Install supports for vertical stainless-steel piping every 10 feet.

K. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/4: 72 inches with 3/8-inch rod.
2. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
3. NPS 2-1/2: 108 inches with 1/2-inch rod.
4. NPS 3 and NPS 5: 10 feet with 1/2-inch rod.
5. NPS 6: 10 feet with 5/8-inch rod.

6. NPS 8: 10 feet with 3/4-inch rod.

L. Install supports for vertical copper tubing every 10 feet.

M. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.
2. NPS 3: 48 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 48 inches with 3/4-inch rod.
5. NPS 10 and NPS 12: 48 inches with 7/8-inch rod.

N. Install supports for vertical PVC piping every 48 inches.

O. Support piping and tubing not listed above according to MSS SP-58 and manufacturer's written instructions.

## 3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect waste and vent piping to the following:

1. Plumbing Fixtures: Connect waste piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect waste and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
5. Install horizontal backwater valves with cleanout cover flush with floor.
6. Comply with requirements for backwater valves cleanouts and drains specified in Section 221319 "Sanitary Waste Piping Specialties."
7. Equipment: Connect waste piping as indicated.

a. Provide shutoff valve if indicated and union for each connection.
b. Use flanges instead of unions for connections NPS 2-1/2 and larger.

D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.

E. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.

2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

## 3.8 IDENTIFICATION

A. Identify exposed sanitary waste and vent piping.

B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

## 3.9 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary waste and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.

    a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced waste and vent piping until it has been tested and approved.

    a. Expose work that was covered or concealed before it was tested.

3. Roughing-in Plumbing Test Procedure: Test waste and vent piping except outside leaders on completion of roughing-in.

    a. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water.
    b. From 15 minutes before inspection starts to completion of inspection, water level must not drop.
    c. Inspect joints for leaks.

4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight.

    a. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg.
    b. Use U-tube or manometer inserted in trap of water closet to measure this pressure.
    c. Air pressure must remain constant without introducing additional air throughout period of inspection.
    d. Inspect plumbing fixture connections for gas and water leaks.

5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

## 3.10 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect sanitary waste and vent piping during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

D. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

E. Repair damage to adjacent materials caused by waste and vent piping installation.

## 3.11 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following with approval of the building owner:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Copper Type DWV tube, copper drainage fittings, and soldered joints.
3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

C. Aboveground, soil and waste piping NPS 5 and larger shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

D. Aboveground, vent piping NPS 4 and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Copper Type DWV tube, copper drainage fittings, and soldered joints.

    a. Option for Vent Piping, NPS 2-1/2 and NPS 3-1/2: Hard copper tube, Type M; copper pressure fittings; and soldered joints.
3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

E. Aboveground, vent piping NPS 5 and larger shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.

F. Underground, soil, waste, and vent piping NPS 4 and smaller shall be any of the following:

1. Service class, cast-iron soil piping; gaskets; and gasketed joints.
2. Solid wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

G. Underground, soil and waste piping NPS 5 and larger shall be any of the following:

1. Service class, cast-iron soil piping; gaskets; and gasketed joints.
2. Solid-wall PVC pipe; PVC socket fittings; and solvent-cemented joints.

END OF SECTION 221316

# SECTION 221319 - SANITARY WASTE PIPING SPECIALTIES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Backwater valves.
2. Cleanouts.
3. Roof flashing assemblies.
4. Miscellaneous sanitary drainage piping specialties.

B. Related Requirements:

1. Section 221423 "Storm Drainage Piping Specialties" for trench drains for storm water, channel drainage systems for storm water, roof drains, and catch basins.

### 1.2 DEFINITIONS

A. ABS: Acrylonitrile-butadiene-styrene.

B. PVC: Polyvinyl chloride.

### 1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

### 1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

## PART 2 - PRODUCTS

### 2.1 ASSEMBLY DESCRIPTIONS

A. Sanitary waste piping specialties shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14 for plastic sanitary waste piping specialty components.

## 2.2 BACKWATER VALVES

A. Horizontal, Cast-Iron Backwater Valves:

1. Standard: ASME A112.14.1.
2. Size: Same as connected piping.
3. Body: Cast iron.
4. Cover: Cast iron with bolted or threaded access check valve.
5. End Connections: Hubless.
6. Type Check Valve: Removable, bronze, swing check, factory assembled or field modified to hang open for airflow unless subject to backflow condition.
7. Extension: ASTM A 74, Service class; full-size, cast-iron, soil-pipe extension to field-installed cleanout at floor; replaces backwater valve cover.

B. Horizontal, Plastic Backwater Valves:

1.
2. Size: Same as connected piping.
3. Body: PVC.
4. Cover: Same material as body with threaded access to check valve.
5. Check Valve: Removable swing check.
6. End Connections: Socket type.

## 2.3 CLEANOUTS

A. Cast-Iron Exposed Cleanouts:

1. Standard: ASME A112.36.2M for cast iron for cleanout test tee.
2. Size: Same as connected drainage piping
3. Body Material: Hubless, cast-iron soil pipe test tee as required to match connected piping.
4. Closure: Countersunk, cast-iron plug.
5. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
6. Closure: Stainless-steel plug with seal.

B. Cast-Iron Exposed Floor Cleanouts:
1. Standard: ASME A112.36.2M for adjustable housing cleanout.
2. Size: Same as connected branch.
3. Type: Adjustable housing.
4. Body or Ferrule: Cast iron.
5. Outlet Connection: Threaded.
6. Closure: Brass plug with straight threads and gasket.
7. Adjustable Housing Material: Cast iron with.
8. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
9. Frame and Cover Shape: Round.
10. Top Loading Classification: Extra Heavy Duty.
11. Riser: ASTM A 74, Extra-Heavy Service class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts:

1. Standard: ASME A112.36.2M. Include wall access.
2. Size: Same as connected drainage piping.
3. Body: Hubless, cast-iron soil pipe test tee as required to match connected piping.
4. Closure Plug:

    a. Brass.
    b. Countersunk or raised head.
    c. Drilled and threaded for cover attachment screw.
    d. Size: Same as or not more than one size smaller than cleanout size.

5. Wall Access: Round, deep, chrome-plated bronze cover plate with screw.
6.

D. Plastic Floor Cleanouts:

1. Size: Same as connected branch.
2. Body: PVC.
3. Closure Plug: PVC.
4. Riser: Drainage pipe fitting and riser to cleanout of same material as drainage piping.

## 2.4 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:

1.
2. Description: Manufactured assembly made of 4.0-lb/sq. ft., 0.0625-inch- thick, lead flashing collar and skirt extending at least 8 inches from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.

    a. Open-Top Vent Cap: Without cap.

3.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

A. Install backwater valves in building drain piping.

1. For interior installation, provide cleanout deck plate flush with floor and centered over backwater valve cover, and of adequate size to remove valve cover for servicing.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof. Comply with requirements in Section 076200, Sheet Metal Flashing and Trim.

F. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof. Comply with requirements in Section 076200, Sheet Metal Flashing and Trim.

G. Assemble open drain fittings and install with top of hub 1 inch above floor.

H. Install deep-seal traps on floor drains and other waste outlets, if indicated.

I. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

J. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

K. Install sleeve and sleeve seals with each riser and stack passing through floors with waterproof membrane.

L. Install vent caps on each vent pipe passing through roof.

M. Install expansion joints on vertical stacks and conductors. Position expansion joints for easy access and maintenance.

N. Install wood-blocking reinforcement for wall-mounting-type specialties.

O. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

## 3.2 CONNECTIONS

A. Comply with requirements in Section 221316 "Sanitary Waste and Vent Piping" for piping installation requirements. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

D. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

## 3.3 FLASHING INSTALLATION

A. Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."

B. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required.

C. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

D. Set flashing on floors and roofs in solid coating of bituminous cement.

E. Secure flashing into sleeve and specialty clamping ring or device.

F. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section 076200 "Sheet Metal Flashing and Trim."

G. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

## 3.4 LABELING AND IDENTIFYING

A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.

1. Nameplates and signs are specified in Section 220553 "Identification for Plumbing Piping and Equipment."

## 3.5 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221319

# SECTION 221413 - FACILITY STORM DRAINAGE PIPING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Hubless, cast-iron soil pipe and fittings.
2. PVC pipe and fittings.
3. Specialty pipe and fittings.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

### 1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Detail storm drainage piping. Show support locations, type of support, weight on each support, required clearances, and other details, drawn to scale, and coordinated with each other, using input from installers of the items involved.

B. Field quality-control reports.

### 1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:

1. Storm Drainage Piping: 10-foot head of water or as specified by the area having jurisdiction.

## 2.2 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS

A. Pipe and Fittings:

1. Marked with CISPI collective trademark and NSF certification mark.
2. Standard: ASTM A 888 or CISPI 301.

B. CISPI, Hubless-Piping Couplings:

1. Couplings shall bear CISPI collective trademark and NSF certification mark.
2. Standards: ASTM C 1277 and CISPI 310..
3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

C. Heavy-Duty, Hubless-Piping Couplings:

1. Standard: ASTM C 1540..
2. Description: Stainless-steel shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

D. Cast-Iron, Hubless-Piping Couplings:

1. Standard: ASTM C 1277..
2. Description: Two-piece ASTM A 48/A 48M, cast-iron housing; stainless-steel bolts and nuts; and ASTM C 564, rubber sleeve with integral, center pipe stop.

## 2.3 PVC PIPE AND FITTINGS

A. NSF Marking: Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-drain" for plastic storm drain and "NSF-sewer" for plastic storm sewer piping.

B. Solid-Wall PVC Pipe: ASTM D 2665; drain, waste, and vent.

C. Cellular-Core PVC Pipe: ASTM F 891, Schedule 40.

D. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.

E. Adhesive Primer: ASTM F 656.

F. Solvent Cement: ASTM D 2564.

## 2.4 SPECIALTY PIPE FITTINGS

A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in ODs or of different materials. Include end connections same size as and compatible with pipes to be joined.
2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified-piping-system fitting.
3. Unshielded, Nonpressure Transition Couplings:

    a. Standard: ASTM C 1173.
    b. Description: Elastomeric sleeve, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
    c. Sleeve Materials:

        1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
        2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
        3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.

4. Shielded, Nonpressure Transition Couplings:

    a. Standard: ASTM C 1460.
    b. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
    c. End Connections: Same size as and compatible with pipes to be joined.

# PART 3 - EXECUTION

## 3.1 EARTH MOVING

A. Comply with requirements for excavating, trenching, and backfilling specified in Section 312000 "Earth Moving."

## 3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems.

1. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations.
2. Install piping as indicated unless deviations from layout are approved on coordination drawings.

B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Make changes in direction for piping using appropriate branches, bends, and long-sweep bends.

1. Do not change direction of flow more than 90 degrees.
2. Use proper size of standard increasers and reducers if pipes of different sizes are connected.

    a. Reducing size of drainage piping in direction of flow is prohibited.

K. Lay buried building piping beginning at low point of each system.

1. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream.
2. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
3. Maintain swab in piping and pull past each joint as completed.

L. Install piping at the following minimum slopes unless otherwise indicated:

1. Building Storm Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Storm Drainage Piping: 2 percent downward in direction of flow.

M. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."

N. Install aboveground ABS piping according to ASTM D 2661.

O. Install aboveground PVC piping according to ASTM D 2665.

P. Install underground PVC piping according to ASTM D 2321.

Q. Plumbing Specialties:

1. Install backwater valves in storm drainage gravity-flow piping.

a. Comply with requirements for backwater valves specified in Section 221423 "Storm Drainage Piping Specialties."

2. Install cleanouts at grade and extend to where building storm drains connect to building storm sewers in storm drainage gravity-flow piping.

a. Comply with requirements for cleanouts specified in Section 221423 "Storm Drainage Piping Specialties."

3. Install drains in storm drainage gravity-flow piping.

a. Comply with requirements for drains specified in Section 221423 "Storm Drainage Piping Specialties."

R. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

S. Install sleeves for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for sleeves specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

T. Install sleeve seals for piping penetrations of concrete walls and slabs.

1. Comply with requirements for sleeve seals specified in Section 220517 "Sleeves and Sleeve Seals for Plumbing Piping."

U. Install escutcheons for piping penetrations of walls, ceilings, and floors.

1. Comply with requirements for escutcheons specified in Section 220518 "Escutcheons for Plumbing Piping."

## 3.3 JOINT CONSTRUCTION

A. Hubless, Cast-Iron Soil Piping Coupled Joints:

1. Join according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

B. PVC, Nonpressure-Piping, Solvent-Cemented Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
2. ABS Piping: Join according to ASTM D 2235 and ASTM D 2661 appendices.
3. PVC Piping: Join according to ASTM D 2855 and ASTM D 2665 appendices.

C. Joint Restraints and Sway Bracing:

1. Provide joint restraints and sway bracing for storm drainage piping joints to comply with the following conditions:

a. Provide axial restraint for pipe and fittings 5 inches and larger, upstream and downstream of all changes in direction, branches, and changes in diameter greater than two pipe sizes.
b. Provide rigid sway bracing for pipe and fittings 4 inches and larger, upstream and downstream of all changes in direction 45 degrees and greater.
c. Provide rigid sway bracing for pipe and fittings 5 inches and larger, upstream and downstream of all changes in direction and branch openings.

## 3.4 SPECIALTY PIPE FITTING INSTALLATION

A. Transition Couplings:

1. Install transition couplings at joints of piping with small differences in ODs.

## 3.5 VALVE INSTALLATION

A. General valve installation requirements for general-duty valve installations are specified in the following Sections:

1. Section 220523.12 "Ball Valves for Plumbing Piping."
2. Section 220523.13 "Butterfly Valves for Plumbing Piping."
3. Section 220523.14 "Check Valves for Plumbing Piping."
4. Section 220523.15 "Gate Valves for Plumbing Piping."

B. Shutoff Valves:

1. Install shutoff valve on each sump pump discharge.
2. Install full port ball valve for piping NS 2 and smaller.
3. Install gate valve for piping NPS 2-1/2 and larger.

C. Check Valves: Install swing-check valve, between pump and shutoff valve, on each sump pump discharge.

D. Backwater Valves: Install backwater valves in piping subject to backflow.

1. Install backwater valves in accessible locations.
2. Comply with requirements for backwater valves specified in Section 221423 "Storm Drainage Piping Specialties."

## 3.6 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements for pipe hanger and support devices and installation specified in Section 220529 "Hangers and Supports for Plumbing Piping and Equipment."

1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
2. Install stainless-steel or fiberglass pipe hangers for horizontal piping in corrosive environments.
3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
5. Vertical Piping: MSS Type 8 or Type 42, clamps.
6. Install individual, straight, horizontal piping runs:

    a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.

7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
8. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
2. NPS 3: 60 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 60 inches with 3/4-inch rod.
5. NPS 10 and NPS 12: 60 inches with 7/8-inch rod.
6. Spacing for 10-foot pipe lengths may be increased to 10 feet. Spacing for fittings is limited to 60 inches.

F. Install supports for vertical cast-iron soil piping every 15 feet.

G. Install hangers for PVC piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2: 48 inches with 3/8-inch rod.

2. NPS 3: 48 inches with 1/2-inch rod.
3. NPS 4 and NPS 5: 48 inches with 5/8-inch rod.
4. NPS 6 and NPS 8: 48 inches with 3/4-inch rod.
5. NPS 10 and NPS 12: 48 inches with 7/8-inch rod.

H. Install supports for vertical PVC piping every 48 inches.

I. Support piping and tubing not listed above according to MSS SP-58 and manufacturer's written instructions.

## 3.7 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect interior storm drainage piping to exterior storm drainage piping. Use transition fitting to join dissimilar piping materials.

C. Connect storm drainage piping to roof drains and storm drainage specialties.

1. Install test tees (wall cleanouts) in conductors near floor, and floor cleanouts with cover flush with floor.
2. Install horizontal backwater valves with cleanout cover flush with floor.
3. Comply with requirements for backwater valves cleanouts and drains specified in Section 221423 "Storm Drainage Piping Specialties."

D. Where installing piping adjacent to equipment, allow space for service and maintenance.

E. Make connections according to the following unless otherwise indicated:

1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

## 3.8 IDENTIFICATION

A. Identify exposed storm drainage piping.

B. Comply with requirements for identification specified in Section 220553 "Identification for Plumbing Piping and Equipment."

## 3.9 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Test storm drainage piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:

1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired.

    a. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.

2. Leave uncovered and unconcealed new, altered, extended, or replaced storm drainage piping until it has been tested and approved.

    a. Expose work that was covered or concealed before it was tested.

3. Test Procedure:

    a. Test storm drainage piping, except outside leaders, on completion of roughing-in.
    b. Close openings in piping system and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts until completion of inspection, water level must not drop. Inspect joints for leaks.

4. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

C. Piping will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

## 3.10 CLEANING AND PROTECTION

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

## 3.11 PIPING SCHEDULE

A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.

B. Aboveground storm drainage piping NPS 6 and smaller shall be any of the following with coordination with the building owner:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI, hubless-piping couplings; and coupled joints.
3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

C. Aboveground, storm drainage piping NPS 8 and larger shall be any of the following with building owner coordination:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI, hubless-piping couplings; and coupled joints.
3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
4.

D. Underground storm drainage piping NPS 6 and smaller shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI, hubless-piping couplings; and coupled joints.
3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

E. Underground, storm drainage piping NPS 8 and larger shall be any of the following:

1. Service class, cast-iron soil pipe and fittings; gaskets; and gasketed joints.
2. Hubless, cast-iron soil pipe and fittings; CISPI, hubless-piping couplings; and coupled joints.
3. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
4. Cellular-core, sewer and drain series, PVC pipe; PVC socket fittings; and solvent-cemented joints.

END OF SECTION 221413

# SECTION 221423 - STORM DRAINAGE PIPING SPECIALTIES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Metal roof drains.
2. Miscellaneous storm drainage piping specialties.
3. Cleanouts.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

### 1.3 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

## PART 2 - PRODUCTS

### 2.1 METAL ROOF DRAINS

A. Cast-Iron, General-Purpose Roof Drains:

1. Standard: ASME A112.6.4.
2. Body Material: Cast iron.
3. Dome Material: Aluminum, Bronze or HDPE
4. Combination Flashing Ring and Gravel Stop: As Required
5. Flow-Control Weirs: As required.
6. Outlet orientation: Reference Storm Water Plan.
7. Outlet Type: No hub.

### 2.2 MISCELLANEOUS STORM DRAINAGE PIPING SPECIALTIES

A. Downspout Adaptors:

1. Description: Manufactured, gray-iron casting, for attaching to horizontal-outlet, parapet roof drain and to exterior, sheet metal downspout.
2. Size: Inlet size to match parapet drain outlet.

B. Downspout Boots:

1. Description: Manufactured, ASTM A 48/A 48M, gray-iron casting, with strap or ears for attaching to building; NPS 4 outlet; and shop-applied bituminous coating.
2. Size: Inlet size to match downspout and NPS 4 outlet.

C. Conductor Nozzles:

1. Description: Bronze body with threaded inlet and bronze wall flange with mounting holes.
2. Size: Same as connected conductor.

## 2.3 CLEANOUTS

A. Cast-Iron Exposed Cleanouts:

1. Standard: ASME A112.36.2M.
2. Size: Same as connected branch.
3. Body Material: No-hub, cast-iron soil pipe test tee as required to match connected piping.
4. Closure: Countersunk or raised-head, brass plug.
5. Closure Plug Size: Same as, or not more than, one size smaller than cleanout size.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

A. Install roof drains at low points of roof areas according to roof membrane manufacturer's written installation instructions.

1. Install flashing collar or flange of roof drain to prevent leakage between drain and adjoining roofing. Maintain integrity of waterproof membranes where penetrated.
2. Install expansion joints, if indicated, in roof drain outlets.
3. Position roof drains for easy access and maintenance.

B. Install downspout adapters on outlet of back-outlet parapet roof drains and connect to sheet metal downspouts.

C. Install downspout boots at grade with top 12 inches above grade. Secure to building wall.

D. Install conductor nozzles at exposed bottom of conductors where they spill onto grade.

E. Install cleanouts in aboveground piping and building drain piping according to the following instructions unless otherwise indicated:

1. Use cleanouts the same size as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate cleanouts at each change in direction of piping greater than 45 degrees.
3. Locate cleanouts at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
4. Locate cleanouts at base of each vertical storm piping conductor.

F. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

G. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

H. Install horizontal backwater valves in floor with cover flush with floor.

I. Install test tees in vertical conductors and near floor.

J. Install wall cleanouts in vertical conductors. Install access door in wall if indicated.

K. Install trench drains at low points of surface areas to be drained. Set grates of drains flush with finished surface unless otherwise indicated.

L. Install through-penetration firestop assemblies for penetrations of fire- and smoke-rated assemblies.

1. Comply with requirements in Section 078413 "Penetration Firestopping".

M. Comply with requirements for piping specified in Section 221413 "Facility Storm Drainage Piping." Drawings indicate general arrangement of piping, fittings, and specialties.

## 3.2 FLASHING INSTALLATION

A. Fabricate flashing from single piece of metal unless large pans, sumps, or other drainage shapes are required.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

## 3.3 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 221423

# SECTION 224213.13 - COMMERCIAL WATER CLOSETS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Water closets.
2. Flushometer valves.
3. Toilet seats.
4. Supports.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

### 1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flushometer valves and electronic sensors to include in operation and maintenance manuals.

## PART 2 - PRODUCTS

### 2.1 FLOOR-MOUNTED, BOTTOM-OUTLET WATER CLOSETS

A. Water Closets: Floor mounted, bottom outlet, top spud.

1. Bowl:

a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
b. Material: Vitreous china.
c. Type: Siphon jet.
d. Style: Flushometer valve.
e. Height: Standard and Handicapped/elderly, complying with ICC/ANSI A117.1. Reference plumbing plan
f. Rim Contour: Elongated.
g. Water Consumption: 1.28 gal. per flush.
h. Spud Size and Location: NPS 1-1/2; top.
i. Color: White or as specified by interior designer. Coordinate with interior designer as required

2. Bowl-to-Drain Connecting Fitting: ASTM A 1045 or ASME A112.4.3.
3. Flushometer Valve: Reference Section 2.3.
4. Toilet Seat: Reference Section 2.4.

## 2.2 WALL-MOUNTED WATER CLOSETS

A. Water Closets: Wall mounted, top spud, accessible.

1. Bowl:

   a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
   b. Material: Vitreous china.
   c. Type: Siphon jet.
   d. Style: Flushometer valve.
   e. Height: Standard.
   f. Rim Contour: Elongated.
   g. Water Consumption: 1.28 gal. per flush.
   h. Spud Size and Location: NPS 1-1/2; top.

2. Flushometer Valve: Reference Section 2.3.
3. Toilet Seat: Reference Section 2.4.
4. Support: Floor mounted wall carriers.
5. Water-Closet Mounting Height: Standard and Handicapped/elderly according to ICC A117.1. Reference Plumbing Plans

## 2.3 AUTOMATIC FLUSHOMETER VALVES

A. Battery Operated Flushometer Valves:

1. Zurn or Sloan
2. Standard: ASSE 1037.
3. Minimum Pressure Rating: 125 psig.
4. Features: Include integral check stop and backflow-prevention device.
5. Material: Brass body with corrosion-resistant components.
6. Exposed Flushometer-Valve Finish: Chrome plated.
7. Panel Finish: Chrome plated or stainless steel.
8. Style: Exposed.
9. Consumption: 1.28 gal. per flush.
10. Minimum Inlet: NPS 1.
11. Minimum Outlet: NPS 1-1/4.

B. Hard Wired Flushometer Valves:

1. Zurn or Sloan
2. Standard: ASSE 1037.
3. Minimum Pressure Rating: 125 psig.
4. Features: Include integral check stop and backflow-prevention device.

5. Material: Brass body with corrosion-resistant components.
6. Exposed Flushometer-Valve Finish: Chrome plated.
7. Panel Finish: Chrome plated or stainless steel.
8. Style: Concealed.
9. Consumption: 1.28 gal. per flush.
10. Minimum Inlet: NPS 1.
11. Minimum Outlet: NPS 1-1/4.

## 2.4 TOILET SEATS

A. Toilet Seats:

1. Standard: IAPMO/ANSI Z124.5.
2. Material: Plastic.
3. Type: Commercial (Standard).
4. Shape: Elongated rim, open front.
5. Hinge: Self-sustaining.
6. Hinge Material: Noncorroding metal.
7. Seat Cover: Not required.
8. Color: White or as specified by Interior Designer. Contractor shall coordinate with Interior Designer as required

## 2.5 SUPPORTS

A. Water Closet Floor Mount Wall Carrier:

1. Standard: ASME A112.6.1M.
2. Description: Waste-fitting assembly, as required to match drainage piping material and arrangement with faceplates, couplings gaskets, and feet; bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

A. Water-Closet Installation:

1. Install level and plumb according to roughing-in drawings.
2. Install floor-mounted water closets on bowl-to-drain connecting fitting attachments to piping or building substrate.
3. Install accessible, wall-mounted water closets at mounting height for handicapped/elderly, according to ICC/ANSI A117.1.

B. Support Installation:

1. Install supports, affixed to building substrate, for floor-mounted, back-outlet water closets.
2. Use carrier supports with waste-fitting assembly and seal.
3. Install wall-mounted, back-outlet water-closet supports with waste-fitting assembly and waste-fitting seals; and affix to building substrate.

C. Flushometer-Valve Installation:

1. Install flushometer-valve, water-supply fitting on each supply to each water closet.
2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
3. Install actuators in locations that are easy for people with disabilities to reach.

D. Install toilet seats on water closets.

E. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
2. Install deep-pattern escutcheons if required to conceal protruding fittings.
3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

F. Joint Sealing:

1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to water-closet color.
3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

## 3.2 CONNECTIONS

A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

D. Where installing piping adjacent to water closets, allow space for service and maintenance.

## 3.3 ADJUSTING

A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.

B. Adjust water pressure at flushometer valves to produce proper flow.

3.4 CLEANING AND PROTECTION

A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.

B. Install protective covering for installed water closets and fittings.

C. Do not allow use of water closets for temporary facilities unless approved in writing by Owner.

END OF SECTION 224213.13

# SECTION 224213.16 - COMMERCIAL URINALS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Urinals.
2. Flushometer valves.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include diagrams for power, signal, and control wiring.

### 1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For flushometer valves and electronic sensors to include in operation and maintenance manuals.

## PART 2 - PRODUCTS

### 2.1 WALL-HUNG URINALS

A. Urinals: Wall hung, back outlet, siphon jet.

1. Fixture:

a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
b. Material: Vitreous china.
c. Type: Siphon jet.
d. Strainer or Trapway: Manufacturer's standard strainer with integral trap.
e. Water Consumption: Low.
f. Spud Size and Location: NPS 3/4; top.
g. Outlet Size and Location: NPS 2; back.
h. Color: White or as specified by the interior designer. Contractor shall coordinate with the interior designer as required

2. Flushometer Valve: Reference Section 2.2.
3. Waste Fitting:

a. Standard: ASME A112.18.2/CSA B125.2 for coupling.

b. Size: NPS 2.

4. Support: Type I Urinal Carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture..
5. Urinal Mounting Height: Standard and Handicapped/elderly according to ICC A117.1.

B. Urinals: Wall hung, back outlet, washout.

1. Fixture:

a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
b. Material: Vitreous china.
c. Type: Washout with extended shields.
d. Strainer or Trapway: Manufacturer's standard strainer with integral trap.
e. Water Consumption: Low.
f. Spud Size and Location: NPS 3/4, back.
g. Outlet Size and Location: NPS 2, back.
h. Color: White or as specified by the interior designer. Contractor shall coordinate with the interior designer as required

2. Flushometer Valve: Reference Section 2.2.
3. Waste Fitting:

a. Standard: ASME A112.18.2/CSA B125.2 for coupling.
b. Size: NPS 2.

4. Support: Type I Urinal Carrier with fixture support plates and coupling with seal and fixture bolts and hardware matching fixture..
5. Urinal Mounting Height: Standard and Handicapped/elderly according to ICC A117.1.

## 2.2 AUTOMATIC URINAL FLUSHOMETER VALVES

A. Battery-Powered, Solenoid-Actuator, Piston Flushometer Valves:

1. Zurn and Sloan
2. Standard: ASSE 1037.
3. Minimum Pressure Rating: 125 psig.
4. Features: Include integral check stop and backflow-prevention device.
5. Material: Brass body with corrosion-resistant components.
6. Exposed Flushometer-Valve Finish: Chrome plated.
7. Style: Exposed.
8. Actuator: Solenoid complying with UL 1951; listed and labeled as defined in NFPA 70, by a qualified testing agency; and marked for intended location and application.
9. Trip Mechanism: Battery-powered electronic sensor complying with UL 1951; listed and labeled as defined in NFPA 70, by a qualified testing agency; and marked for intended location and application.

10. Consumption: 0.5 gal. per flush.
11. Minimum Inlet: NPS 3/4.
12. Minimum Outlet: NPS 3/4.

## 2.3 SUPPORTS

A. Type I Urinal Carrier:
   1. Standard: ASME A112.6.1M.

B. Type II Urinal Carrier:
   1. Standard: ASME A112.6.1M.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before urinal installation.

B. Examine walls and floors for suitable conditions where urinals will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION

A. Urinal Installation:

   1. Install urinals level and plumb according to roughing-in drawings.
   2. Install wall-hung, back-outlet urinals onto waste fitting seals and attached to supports.
   3. Install wall-hung, bottom-outlet urinals with tubular waste piping attached to supports.
   4. Install accessible, wall-mounted urinals at mounting height for the handicapped/elderly, according to ICC/ANSI A117.1.
   5. Install trap-seal liquid in waterless urinals.

B. Support Installation:

   1. Install supports, affixed to building substrate, for wall-hung urinals.
   2. Use off-floor carriers with waste fitting and seal for back-outlet urinals.
   3. Use carriers without waste fitting for urinals with tubular waste piping.
   4. Use chair-type carrier supports with rectangular steel uprights for accessible urinals.

C. Flushometer-Valve Installation:

   1. Install flushometer-valve water-supply fitting on each supply to each urinal.

2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
3. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

D. Wall Flange and Escutcheon Installation:

1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations.
2. Install deep-pattern escutcheons if required to conceal protruding fittings.
3. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

E. Joint Sealing:

1. Seal joints between urinals and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
2. Match sealant color to urinal color.
3. Comply with sealant requirements specified in Section 079200 "Joint Sealants."

## 3.3 CONNECTIONS

A. Connect urinals with water supplies and soil, waste, and vent piping. Use size fittings required to match urinals.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

D. Where installing piping adjacent to urinals, allow space for service and maintenance.

## 3.4 ADJUSTING

A. Operate and adjust urinals and controls. Replace damaged and malfunctioning urinals, fittings, and controls.

B. Adjust water pressure at flushometer valves to produce proper flow.

C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

## 3.5 CLEANING AND PROTECTION

A. Clean urinals and fittings with manufacturers' recommended cleaning methods and materials.

B. Install protective covering for installed urinals and fittings.

C. Do not allow use of urinals for temporary facilities unless approved in writing by Owner.

END OF SECTION 224213.16

# SECTION 224216.13 - COMMERCIAL LAVATORIES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Lavatories.
2. Faucets.
3. Supports.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: Include diagrams for power, signal, and control wiring of automatic faucets.

### 1.3 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

### 1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lavatories and faucets to include in operation and maintenance manuals.

1. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

a. Servicing and adjustments of automatic faucets.

## PART 2 - PRODUCTS

### 2.1 VITREOUS-CHINA, COUNTER-MOUNTED LAVATORIES

A. Lavatory: Oval or Round, self-rimming, vitreous china, counter mounted.

1. Fixture:

a. Standard: ASME A112.19.2/CSA B45.1.

b. Type: Self-rimming for above-counter mounting.
c. Nominal Size: Oval, 19 by 17 inches.
d. Nominal Size: Round, 19 inches.
e. Faucet-Hole Punching: Coordinate hole punching with fixture selection. Coordinate with interior designer
f. Faucet-Hole Location: Top.
g. Color: White or as specified by interior designer.
h. Mounting Material: Sealant.

2. Faucet: Reference Section 2.3.

B. Lavatory: Oval, vitreous china, undercounter mounted.

1. Fixture:

a. Standard: ASME A112.19.2/CSA B45.1.
b. Type: For undercounter mounting.
c. Nominal Size: Oval, 19 by 16 inches.
d. Faucet-Hole Punching: No holes.
e. Faucet-Hole Location: On countertop.
f. Color: White or as specified by interior designer.
g. Mounting Material: Sealant and undercounter mounting kit.

2. Faucet: Reference Section 2.3.

## 2.2 VITREOUS-CHINA, WALL-MOUNTED LAVATORIES

A. Lavatory: Vitreous china, wall mounted, with back.

1. Fixture:

a. Standard: ASME A112.19.2/CSA B45.1.
b. Type: For wall hanging.
c. Nominal Size: Oval, 19 by 16 inches.
d. Faucet-Hole Punching: Coordinate with interior design.
e. Faucet-Hole Location: Top.
f. Color: White or as specified by the interior Designer.
g. Mounting Material: Chair carrier.

2. Faucet: Reference Section 2.3.
3. Support: Type I, exposed-arm lavatory carrier.
4. Lavatory Mounting Height: Standard

B. Lavatory: Ledge back, vitreous china, wall mounted.

1. Fixture:

a. Standard: ASME A112.19.2/CSA B45.1.

b. Type: For wall hanging.
c. Nominal Size: Oval, 19 by 16 inches.
d. Faucet-Hole Punching: Coordinate with interior designer.
e. Faucet-Hole Location: Top.
f. Color: White or as specified by interior designer.
g. Mounting Material: Chair carrier.

2. Faucet: Reference Section 2.3.
3. Support: Type I, exposed-arm lavatory carrier..
4. Lavatory Mounting Height: Standard.

C. Lavatory: Wheelchair, vitreous china, wall mounted.

1. Fixture:

a. Standard: ASME A112.19.2/CSA B45.1.
b. Type: Slab or wheelchair.
c. Nominal Size: Rectangular, 27 by 20 inches.
d. Faucet-Hole Punching: Three holes, 2-inch centers.
e. Faucet-Hole Location: Top.
f. Color: White or as specified by the interior designer.
g. Mounting: For concealed-arm carrier.

2. Faucet: Reference Section 2.3.
3. Support: Type II, concealed-arm lavatory carrier.
4. Lavatory Mounting Height: Handicapped/elderly according to ICC A117.1.

## 2.3 SOLID-BRASS, MANUALLY OPERATED FAUCETS

A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.

B. Lavatory Faucets: Manual-type,, commercial general-duty, solid-brass valve.

1. Reference the Plumbing Fixture Schedule for based bid. Contractor to coordinate with the interior designer as required
2. Standard: ASME A112.18.1/CSA B125.1.
3. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
4. Body Type: Coordinate with interior designer.
5. Body Material: Commercial, solid brass.
6. Finish: Coordinate with interior designer.
7. Maximum Flow Rate: 0.5 gpm.
8. Mounting Type: Deck, exposed.
9. Valve Handle(s): Reference plumbing fixture schedule.

## 2.4 SUPPORTS

A. Type II Lavatory Carrier:
   1. Standard: ASME A112.6.1M.

B. Type III Lavatory Carrier:

   1. Standard: ASME A112.6.1M.

## 2.5 SUPPLY FITTINGS

A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.

B. Standard: ASME A112.18.1/CSA B125.1.

C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless-steel wall flange.

D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.

E. Operation: Wheel handle.

F. Risers:

   1. NPS 3/8.
   2. Chrome-plated, soft-copper flexible tube riser.

## 2.6 WASTE FITTINGS

A. Standard: ASME A112.18.2/CSA B125.2.

B. Drain: Grid type with NPS 1-1/4 offset and straight tailpiece.

C. Trap:

   1. Size: NPS 1-1/2 by NPS 1-1/4.
   2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch- thick brass tube to wall; and chrome-plated, brass or steel wall flange.
   3. Material: Stainless-steel, two-piece trap and swivel elbow with 0.012-inch- thick stainless-steel tube to wall; and stainless-steel wall flange.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before lavatory installation.

B. Examine counters and walls for suitable conditions where lavatories will be installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

A. Install lavatories level and plumb according to roughing-in drawings.

B. Install supports, affixed to building substrate, for wall-mounted lavatories.

C. Install accessible wall-mounted lavatories at handicapped/elderly mounting height for people with disabilities or the elderly, according to ICC/ANSI A117.1.

D. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 220518 "Escutcheons for Plumbing Piping."

E. Seal joints between lavatories and counters and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Indicate on Drawings those lavatories that are required to be accessible.

F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories.

### 3.3 CONNECTIONS

A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

B. Comply with water piping requirements specified in Section 221116 "Domestic Water Piping."

C. Comply with soil and waste piping requirements specified in Section 221316 "Sanitary Waste and Vent Piping."

### 3.4 ADJUSTING

A. Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.

B. Adjust water pressure at faucets to produce proper flow.

C. Install fresh batteries in battery-powered, electronic-sensor mechanisms.

3.5 CLEANING AND PROTECTION

A. After completing installation of lavatories, inspect and repair damaged finishes.

B. Clean lavatories, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.

C. Provide protective covering for installed lavatories and fittings.

D. Do not allow use of lavatories for temporary facilities unless approved in writing by Owner.

END OF SECTION 224216.13

# SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes general requirements for single-phase and polyphase, general-purpose, horizontal, small and medium, squirrel-cage induction motors for use on alternating-current power systems up to 600 V and installed at equipment manufacturer's factory or shipped separately by equipment manufacturer for field installation.

### 1.2 COORDINATION

A. Coordinate features of motors, installed units, and accessory devices to be compatible with the following:

1. Motor controllers.
2. Torque, speed, and horsepower requirements of the load.
3. Ratings and characteristics of supply circuit and required control sequence.
4. Ambient and environmental conditions of installation location.

## PART 2 - PRODUCTS

### 2.1 GENERAL MOTOR REQUIREMENTS

A. Comply with NEMA MG 1 unless otherwise indicated.

### 2.2 MOTOR CHARACTERISTICS

A. Duty: Continuous duty at ambient temperature of 40 deg C and at altitude of 3300 feet above sea level.

B. Capacity and Torque Characteristics: Sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

### 2.3 POLYPHASE MOTORS

A. Description: NEMA MG 1, Design B, medium induction motor.

B. Efficiency: Premium efficient, as defined in NEMA MG 1.

C. Service Factor: 1.15.

D. Multispeed Motors: Variable torque.

1. For motors with 2:1 speed ratio, consequent pole, single winding.
2. For motors with other than 2:1 speed ratio, separate winding for each speed.

E. Rotor: Random-wound, squirrel cage.

F. Bearings: Regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading.

G. Temperature Rise: Match insulation rating.

H. Insulation: **Class F**

I. Code Letter Designation:

1. Motors **5** HP and Larger: NEMA starting Code F or Code G.
2. Motors Smaller Than **5** HP: Manufacturer's standard starting characteristic.

J. Enclosure Material: Cast iron for motor frame sizes **324T** and larger; rolled steel for motor frame sizes smaller than **324T**

## 2.4 ADDITIONAL REQUIREMENTS FOR POLYPHASE MOTORS

A. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.

B. Motors Used with Variable-Frequency Controllers:

1. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width-modulated inverters.
2. Premium-Efficient Motors: Class B temperature rise; Class F insulation.
3. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
4. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.

## 2.5 SINGLE-PHASE MOTORS

A. Motors larger than 1/20 HP shall be one of the following, to suit starting torque and requirements of specific motor application:

1. Permanent-split capacitor.
2. Split phase.
3. Capacitor start, inductor run.
4. Capacitor start, capacitor run.

B. Multispeed Motors: Variable-torque, permanent-split-capacitor type.

C. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

D. Motors 1/20 HP and Smaller: Shaded-pole type.

E. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 230513

# SECTION 230517 - SLEEVES AND SLEEVE SEALS FOR HVAC PIPING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Sleeves.
2. Sleeve-seal systems.
3. Grout.
4. Silicone sealants.

B. Related Requirements:

1. Section 078413 "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

### 1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

## PART 2 - PRODUCTS

### 2.1 SLEEVES

A. Cast-Iron Pipe Sleeves: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop collar.

B. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, anti-corrosion coated or zinc coated, with plain ends and integral welded waterstop collar.

C. Galvanized-Steel Sheet Pipe Sleeves: 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint.

D. PVC Pipe Sleeves: ASTM D 1785, Schedule 40.

## 2.2 SLEEVE-SEAL SYSTEMS

A.

B. Description:

1. Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
2. Designed to form a hydrostatic seal of 20-psig.
3. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size.
4. Pressure Plates: Carbon steel.
5. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, ASTM B 633 of length required to secure pressure plates to sealing elements.

## 2.3 GROUT

A. Description: Nonshrink, recommended for interior and exterior sealing openings in nonfire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

## 2.4 SILICONE SEALANTS

A. Silicone, S, NS, 25, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant, ASTM C 920, Type S, Grade NS, Class 25, use NT.

B. Silicone, S, P, 25, T, NT: Single-component, pourable, plus 25 percent and minus 25 percent movement capability, traffic- and nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade P, Class 25, Uses T and NT. Grade P Pourable (self-leveling) formulation is for opening in floors and other horizontal surfaces that are not fire rated.

# PART 3 - EXECUTION

## 3.1 SLEEVE INSTALLATION

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.

1. Cut sleeves to length for mounting flush with both surfaces.

a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.

2. Using grout or silicone sealant, seal space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use sealants appropriate for size, depth, and location of joint.

E. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke-Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping and fill materials specified in Section 078413 "Penetration Firestopping."

## 3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal-system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

## 3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Leak Test: After allowing for a full cure, test sleeves and sleeve seals for leaks. Repair leaks and retest until no leaks exist.

B. Sleeves and sleeve seals will be considered defective if they do not pass tests and inspections.

3.4 SLEEVE AND SLEEVE-SEAL SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:

1. Exterior Concrete Walls Above Grade:

a. Piping Smaller Than NPS 6: Steel-pipe sleeves.
b. Piping NPS 6 and Larger: Steel-pipe sleeves.

2. Exterior Concrete Walls Below Grade:

a. Piping Smaller Than NPS 6: Steel-pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Steel-pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

3. Concrete Slabs-on-Grade:

a. Piping Smaller Than NPS 6: Steel-pipe sleeves with sleeve-seal system.

1) Select sleeve size to allow for 1-inch annular clear space between piping and sleeve for installing sleeve-seal system.

b. Piping NPS 6 and Larger: Steel-pipe sleeves with sleeve-seal system.

4. Concrete Slabs Above Grade:

a. Piping Smaller Than NPS 6: Steel-pipe sleeves.
b. Piping NPS 6 and Larger: Steel-pipe sleeves.

5. Interior Partitions:

a. Piping Smaller Than NPS 6: Galvanized-steel pipe sleeves.
b. Piping NPS 6 and Larger: Galvanized-steel sheet sleeves.

END OF SECTION 230517

# SECTION 230518 - ESCUTCHEONS FOR HVAC PIPING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Escutcheons.
2. Floor plates.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

## PART 2 - PRODUCTS

A.

### 2.2 ESCUTCHEONS

A. One-Piece, Steel Type: With polished, chrome-plated finish and setscrew fastener.

B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped steel with polished, chrome-plated finish and spring-clip fasteners.

C. One-Piece, Stamped-Steel Type: With polished, chrome-plated finish and spring-clip fasteners.

D. Split-Plate, Stamped-Steel Type: With polished, chrome-plated finish; concealed and exposed-rivet hinge; and spring-clip fasteners.

### 2.3 FLOOR PLATES

A. Split Floor Plates: Steel with concealed hinge.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. Escutcheons for New Piping and Relocated Existing Piping:

a. Piping with Fitting or Sleeve Protruding from Wall: One-piece deep pattern.
b. Chrome-Plated Piping: One-piece steel or split-plate steel with polished, chrome-plated finish.
c. Insulated Piping: One-piece steel with polished, chrome-plated finish.
d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece steel with polished, chrome-plated finish.
e. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece steel with polished, chrome-plated finish.
f.

2. Escutcheons for Existing Piping to Remain:

a. Chrome-Plated Piping: Split-plate, stamped steel with concealed or exposed-rivet hinge with polished, chrome-plated finish.
b. Insulated Piping: Split-plate, stamped steel with concealed or exposed-rivet hinge with polished, chrome-plated finish.
c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-plate, stamped steel with concealed or exposed-rivet hinge with polished, chrome-plated finish.
d. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-plate, stamped steel with concealed or exposed-rivet hinge with polished, chrome-plated finish.

C. Install floor plates for piping penetrations of equipment-room floors.

D. Install floor plates with ID to closely fit around pipe, tube, and insulation of piping and with OD that completely covers opening.

1. New Piping and Relocated Existing Piping: Split floor plate.
2. Existing Piping to Remain: Split floor plate.

## 3.2 FIELD QUALITY CONTROL

A. Using new materials, replace broken and damaged escutcheons and floor plates.

END OF SECTION 230518

# SECTION 230523 - GENERAL-DUTY VALVES FOR HVAC PIPING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Brass ball valves.
2. Bronze ball valves.
3. Iron, single-flange butterfly valves.
4. High-performance butterfly valves.
5. Bronze swing check valves.
6. Iron swing check valves.
7. Iron swing check valves with closure control.
8. Bronze gate valves.
9. Iron gate valves.
10. Bronze globe valves.
11. Iron globe valves.

B. Related Sections:

1. Section 230553 "Identification for HVAC Piping and Equipment" for valve tags and schedules.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of valve indicated.

### 1.3 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

## PART 2 - PRODUCTS

### 2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to HVAC valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 8 and larger.
2. Handwheel: For valves other than quarter-turn types.
3. Handlever: For quarter-turn valves NPS 6 and smaller.

E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Gate Valves: With rising stem.
2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
3. Butterfly Valves: With extended neck.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Solder Joint: With sockets according to ASME B16.18.
3. Threaded: With threads according to ASME B1.20.1.

## 2.2 BRASS BALL VALVES

A. Two-Piece, Full-Port, Brass Ball Valves with Brass Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. DynaQuip Controls.
d. Flow-Tek, Inc.; a subsidiary of Bray International, Inc.
e. Hammond Valve.
f. Jamesbury; a subsidiary of Metso Automation.
g. Jomar International, LTD.
h. Kitz Corporation.
i. Legend Valve.
j. Marwin Valve; a division of Richards Industries.
k. Milwaukee Valve Company.
l. NIBCO INC.
m. Red-White Valve Corporation.
n. RuB Inc.
o. Conbraco Industries Inc: Apollo Valves

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Forged brass.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Brass.
i. Ball: Chrome-plated brass.
j. Port: Full.

B. Two-Piece, Full-Port, Brass Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Flow-Tek, Inc.; a subsidiary of Bray International, Inc.
d. Hammond Valve.
e. Jamesbury; a subsidiary of Metso Automation.
f. Kitz Corporation.
g. Marwin Valve; a division of Richards Industries.
h. Milwaukee Valve Company.
i. RuB Inc.
j. Conbraco Industries Inc: Apollo Valves

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Forged brass.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Stainless steel.
i. Ball: Stainless steel, vented.
j. Port: Full.

## 2.3 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. American Valve, Inc.
b. Conbraco Industries, Inc.; Apollo Valves.

c. Crane Co.; Crane Valve Group; Crane Valves.
d. Hammond Valve.
e. Lance Valves; a division of Advanced Thermal Systems, Inc.
f. Legend Valve.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Red-White Valve Corporation.
j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Bronze.
i. Ball: Chrome-plated brass.
j. Port: Full.

B. Two-Piece, Full-Port, Bronze Ball Valves with Stainless-Steel Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. Conbraco Industries, Inc.; Apollo Valves.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Hammond Valve.
d. Lance Valves; a division of Advanced Thermal Systems, Inc.
e. Milwaukee Valve Company.
f. NIBCO INC.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
h.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Stainless steel.
i. Ball: Stainless steel, vented.
j. Port: Full.

## 2.4 IRON, SINGLE-FLANGE BUTTERFLY VALVES

A. 150 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

   a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
   b. Bray Controls; a division of Bray International.
   c. Conbraco Industries, Inc.; Apollo Valves.
   d. Cooper Cameron Valves; a division of Cooper Cameron Corp.
   e. Crane Co.; Crane Valve Group; Jenkins Valves.
   f. Crane Co.; Crane Valve Group; Stockham Division.
   g. DeZurik Water Controls.
   h. Hammond Valve.
   i. Kitz Corporation.
   j. Milwaukee Valve Company.
   k. NIBCO INC.
   l. Norriseal; a Dover Corporation company.
   m. Red-White Valve Corporation.
   n. Spence Strainers International; a division of CIRCOR International.
   o. Tyco Valves & Controls; a unit of Tyco Flow Control.
   p. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
   q.

2. Description:

   a. Standard: MSS SP-67, Type I.
   b. CWP Rating: 150 psig.
   c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
   d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
   e. Seat: EPDM.
   f. Stem: One- or two-piece stainless steel.
   g. Disc: Aluminum bronze.

B. 150 CWP, Iron, Single-Flange Butterfly Valves with NBR Seat and Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

   a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
   b. Bray Controls; a division of Bray International.
   c. Conbraco Industries, Inc.; Apollo Valves.
   d. Cooper Cameron Valves; a division of Cooper Cameron Corp.
   e. Crane Co.; Crane Valve Group; Jenkins Valves.
   f. Crane Co.; Crane Valve Group; Stockham Division.
   g. DeZurik Water Controls.

h. Hammond Valve.
i. Kitz Corporation.
j. Milwaukee Valve Company.
k. NIBCO INC.
l. Norriseal; a Dover Corporation company.
m. Red-White Valve Corporation.
n. Spence Strainers International; a division of CIRCOR International.
o. Tyco Valves & Controls; a unit of Tyco Flow Control.
p. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 150 psig.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: NBR.
f. Stem: One- or two-piece stainless steel.
g. Disc: Aluminum bronze.

C. 150 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Ductile-Iron Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
b. Bray Controls; a division of Bray International.
c. Conbraco Industries, Inc.; Apollo Valves.
d. Cooper Cameron Valves; a division of Cooper Cameron Corp.
e. Crane Co.; Crane Valve Group; Center Line.
f. Crane Co.; Crane Valve Group; Stockham Division.
g. DeZurik Water Controls.
h. Hammond Valve.
i. Kitz Corporation.
j. Milwaukee Valve Company.
k. Mueller Steam Specialty; a division of SPX Corporation.
l. NIBCO INC.
m. Norriseal; a Dover Corporation company.
n. Spence Strainers International; a division of CIRCOR International.
o. Sure Flow Equipment Inc.
p. Tyco Valves & Controls; a unit of Tyco Flow Control.
q. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 150 psig.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.

d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM.
f. Stem: One- or two-piece stainless steel.
g. Disc: Nickel-plated or -coated ductile iron.

D. 150 CWP, Iron, Single-Flange Butterfly Valves with NBR Seat and Ductile-Iron Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
b. Bray Controls; a division of Bray International.
c. Conbraco Industries, Inc.; Apollo Valves.
d. Cooper Cameron Valves; a division of Cooper Cameron Corp.
e. Crane Co.; Crane Valve Group; Center Line.
f. Crane Co.; Crane Valve Group; Stockham Division.
g. DeZurik Water Controls.
h. Hammond Valve.
i. Kitz Corporation.
j. Milwaukee Valve Company.
k. Mueller Steam Specialty; a division of SPX Corporation.
l. NIBCO INC.
m. Norriseal; a Dover Corporation company.
n. Spence Strainers International; a division of CIRCOR International.
o. Sure Flow Equipment Inc.
p. Tyco Valves & Controls; a unit of Tyco Flow Control.
q. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 150 psig.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: NBR.
f. Stem: One- or two-piece stainless steel.
g. Disc: Nickel-plated or -coated ductile iron.

E. 150 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Stainless-Steel Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
b. Bray Controls; a division of Bray International.
c. Conbraco Industries, Inc.; Apollo Valves.
d. Cooper Cameron Valves; a division of Cooper Cameron Corp.
e. Crane Co.; Crane Valve Group; Jenkins Valves.

f. Crane Co.; Crane Valve Group; Stockham Division.
g. DeZurik Water Controls.
h. Hammond Valve.
i. Kitz Corporation.
j. Milwaukee Valve Company.
k. Mueller Steam Specialty; a division of SPX Corporation.
l. NIBCO INC.
m. Norriseal; a Dover Corporation company.
n. Red-White Valve Corporation.
o. Spence Strainers International; a division of CIRCOR International.
p. Sure Flow Equipment Inc.
q. Tyco Valves & Controls; a unit of Tyco Flow Control.
r. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 150 psig.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM.
f. Stem: One- or two-piece stainless steel.
g. Disc: Stainless steel.

F. 150 CWP, Iron, Single-Flange Butterfly Valves with NBR Seat and Stainless-Steel Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
b. Bray Controls; a division of Bray International.
c. Conbraco Industries, Inc.; Apollo Valves.
d. Cooper Cameron Valves; a division of Cooper Cameron Corp.
e. Crane Co.; Crane Valve Group; Jenkins Valves.
f. Crane Co.; Crane Valve Group; Stockham Division.
g. DeZurik Water Controls.
h. Hammond Valve.
i. Kitz Corporation.
j. Milwaukee Valve Company.
k. Mueller Steam Specialty; a division of SPX Corporation.
l. NIBCO INC.
m. Norriseal; a Dover Corporation company.
n. Red-White Valve Corporation.
o. Spence Strainers International; a division of CIRCOR International.
p. Sure Flow Equipment Inc.
q. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 150 psig.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: NBR.
f. Stem: One- or two-piece stainless steel.
g. Disc: Stainless steel.

G. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
b. Conbraco Industries, Inc.; Apollo Valves.
c. Cooper Cameron Valves; a division of Cooper Cameron Corp.
d. Crane Co.; Crane Valve Group; Jenkins Valves.
e. Crane Co.; Crane Valve Group; Stockham Division.
f. DeZurik Water Controls.
g. Flo Fab Inc.
h. Hammond Valve.
i. Kitz Corporation.
j. Legend Valve.
k. Milwaukee Valve Company.
l. NIBCO INC.
m. Norriseal; a Dover Corporation company.
n. Red-White Valve Corporation.
o. Spence Strainers International; a division of CIRCOR International.
p. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM.
f. Stem: One- or two-piece stainless steel.
g. Disc: Aluminum bronze.

H. 200 CWP, Iron, Single-Flange Butterfly Valves with NBR Seat and Aluminum-Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.

b. Conbraco Industries, Inc.; Apollo Valves.
c. Cooper Cameron Valves; a division of Cooper Cameron Corp.
d. Crane Co.; Crane Valve Group; Jenkins Valves.
e. Crane Co.; Crane Valve Group; Stockham Division.
f. DeZurik Water Controls.
g. Flo Fab Inc.
h. Hammond Valve.
i. Kitz Corporation.
j. Legend Valve.
k. Milwaukee Valve Company.
l. NIBCO INC.
m. Norriseal; a Dover Corporation company.
n. Red-White Valve Corporation.
o. Spence Strainers International; a division of CIRCOR International.
p. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: NBR.
f. Stem: One- or two-piece stainless steel.
g. Disc: Aluminum bronze.

I. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Ductile-Iron Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
b. American Valve, Inc.
c. Conbraco Industries, Inc.; Apollo Valves.
d. Cooper Cameron Valves; a division of Cooper Cameron Corp.
e. Crane Co.; Crane Valve Group; Center Line.
f. Crane Co.; Crane Valve Group; Stockham Division.
g. DeZurik Water Controls.
h. Flo Fab Inc.
i. Hammond Valve.
j. Kitz Corporation.
k. Legend Valve.
l. Milwaukee Valve Company.
m. Mueller Steam Specialty; a division of SPX Corporation.
n. NIBCO INC.
o. Norriseal; a Dover Corporation company.
p. Spence Strainers International; a division of CIRCOR International.
q. Sure Flow Equipment Inc.
r. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: EPDM.
f. Stem: One- or two-piece stainless steel.
g. Disc: Nickel-plated or -coated ductile iron.

J. 200 CWP, Iron, Single-Flange Butterfly Valves with NBR Seat and Ductile-Iron Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
b. American Valve, Inc.
c. Conbraco Industries, Inc.; Apollo Valves.
d. Cooper Cameron Valves; a division of Cooper Cameron Corp.
e. Crane Co.; Crane Valve Group; Center Line.
f. Crane Co.; Crane Valve Group; Stockham Division.
g. DeZurik Water Controls.
h. Flo Fab Inc.
i. Hammond Valve.
j. Kitz Corporation.
k. Legend Valve.
l. Milwaukee Valve Company.
m. Mueller Steam Specialty; a division of SPX Corporation.
n. NIBCO INC.
o. Norriseal; a Dover Corporation company.
p. Spence Strainers International; a division of CIRCOR International.
q. Sure Flow Equipment Inc.
r. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

s. <Description:

t. Standard: MSS SP-67, Type I.
u. CWP Rating: 200 psig.
v. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
w. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
x. Seat: NBR.
y. Stem: One- or two-piece stainless steel.
z. Disc: Nickel-plated or -coated ductile iron.

K. 200 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat and Stainless-Steel Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

    a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
    b. American Valve, Inc.
    c. Conbraco Industries, Inc.; Apollo Valves.
    d. Cooper Cameron Valves; a division of Cooper Cameron Corp.
    e. Crane Co.; Crane Valve Group; Jenkins Valves.
    f. Crane Co.; Crane Valve Group; Stockham Division.
    g. DeZurik Water Controls.
    h. Flo Fab Inc.
    i. Hammond Valve.
    j. Kitz Corporation.
    k. Legend Valve.
    l. Milwaukee Valve Company.
    m. Mueller Steam Specialty; a division of SPX Corporation.
    n. NIBCO INC.
    o. Norriseal; a Dover Corporation company.
    p. Red-White Valve Corporation.
    q. Spence Strainers International; a division of CIRCOR International.
    r. Sure Flow Equipment Inc.
    s. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
    t. .

2. Description:

    a. Standard: MSS SP-67, Type I.
    b. CWP Rating: 200 psig.
    c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
    d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
    e. Seat: EPDM.
    f. Stem: One- or two-piece stainless steel.
    g. Disc: Stainless steel.

L. 200 CWP, Iron, Single-Flange Butterfly Valves with NBR Seat and Stainless-Steel Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

    a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
    b. American Valve, Inc.
    c. Conbraco Industries, Inc.; Apollo Valves.
    d. Cooper Cameron Valves; a division of Cooper Cameron Corp.
    e. Crane Co.; Crane Valve Group; Jenkins Valves.
    f. Crane Co.; Crane Valve Group; Stockham Division.
    g. DeZurik Water Controls.
    h. Flo Fab Inc.
    i. Hammond Valve.

j. Kitz Corporation.
k. Legend Valve.
l. Milwaukee Valve Company.
m. Mueller Steam Specialty; a division of SPX Corporation.
n. NIBCO INC.
o. Norriseal; a Dover Corporation company.
p. Red-White Valve Corporation.
q. Spence Strainers International; a division of CIRCOR International.
r. Sure Flow Equipment Inc.
s. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-67, Type I.
b. CWP Rating: 200 psig.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.
d. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron.
e. Seat: NBR.
f. Stem: One- or two-piece stainless steel.
g. Disc: Stainless steel.

## 2.5 HIGH-PERFORMANCE BUTTERFLY VALVES

A. Class 150, Single-Flange, High-Performance Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. ABZ Valve and Controls; a division of ABZ Manufacturing, Inc.
b. Bray Controls; a division of Bray International.
c. Cooper Cameron Valves; a division of Cooper Cameron Corp.
d. Crane Co.; Crane Valve Group; Flowseal.
e. Crane Co.; Crane Valve Group; Stockham Division.
f. DeZurik Water Controls.
g. Hammond Valve.
h. Jamesbury; a subsidiary of Metso Automation.
i. Milwaukee Valve Company.
j. NIBCO INC.
k. Process Development & Control, Inc.
l. Tyco Valves & Controls; a unit of Tyco Flow Control.
m. Xomox Corporation.

2. Description:

a. Standard: MSS SP-68.
b. CWP Rating: 285 psig at 100 deg F.
c. Body Design: Lug type; suitable for bidirectional dead-end service at rated pressure without use of downstream flange.

d. Body Material: Carbon steel, cast iron, ductile iron, or stainless steel.
e. Seat: Reinforced PTFE or metal.
f. Stem: Stainless steel; offset from seat plane.
g. Disc: Carbon steel.
h. Service: Bidirectional.

## 2.6 BRONZE SWING CHECK VALVES

A. Class 125, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. American Valve, Inc.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. Hammond Valve.
f. Kitz Corporation.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Powell Valves.
j. Red-White Valve Corporation.
k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
l. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 200 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: Bronze.

B. Class 125, Bronze Swing Check Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Kitz Corporation.
f. Milwaukee Valve Company.
g. NIBCO INC.
h. Red-White Valve Corporation.
i. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

j.

2. Description:

a. Standard: MSS SP-80, Type 4.
b. CWP Rating: 200 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: PTFE or TFE.

C. Class 150, Bronze Swing Check Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. American Valve, Inc.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. Kitz Corporation.
f. Milwaukee Valve Company.
g. NIBCO INC.
h. Red-White Valve Corporation.
i. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 300 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: Bronze.

D. Class 150, Bronze Swing Check Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Hammond Valve.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

2. Description:

a. Standard: MSS SP-80, Type 4.

b. CWP Rating: 300 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: PTFE or TFE.

## 2.7 IRON SWING CHECK VALVES

A. Class 125, Iron Swing Check Valves with Metal Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Kitz Corporation.
f. Legend Valve.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Powell Valves.
j. Red-White Valve Corporation.
k. Sure Flow Equipment Inc.
l. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
m. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-71, Type I.
b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
c. NPS 14 to NPS 24, CWP Rating: 150 psig.
d. Body Design: Clear or full waterway.
e. Body Material: ASTM A 126, gray iron with bolted bonnet.
f. Ends: Flanged.
g. Trim: Bronze.
h. Gasket: Asbestos free.

B. Class 125, Iron Swing Check Valves with Nonmetallic-to-Metal Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.

2. Description:

a. Standard: MSS SP-71, Type I.

b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
c. NPS 14 to NPS 24, CWP Rating: 150 psig.
d. Body Design: Clear or full waterway.
e. Body Material: ASTM A 126, gray iron with bolted bonnet.
f. Ends: Flanged.
g. Trim: Composition.
h. Seat Ring: Bronze.
i. Disc Holder: Bronze.
j. Disc: PTFE or TFE.
k. Gasket: Asbestos free.

## 2.8 BRONZE GATE VALVES

A. Class 125, NRS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. American Valve, Inc.
b. Crane Co.; Crane Valve Group; Crane Valves.
c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. Hammond Valve.
f. Kitz Corporation.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Powell Valves.
j. Red-White Valve Corporation.
k. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
l. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 200 psig.
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron.

B. Class 125, RS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. American Valve, Inc.
b. Crane Co.; Crane Valve Group; Crane Valves.

c. Crane Co.; Crane Valve Group; Jenkins Valves.
d. Crane Co.; Crane Valve Group; Stockham Division.
e. Hammond Valve.
f. Kitz Corporation.
g. Milwaukee Valve Company.
h. NIBCO INC.
i. Powell Valves.
j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
k. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 200 psig.
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron.

C. Class 150, NRS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. Hammond Valve.
b. Kitz Corporation.
c. Milwaukee Valve Company.
d. NIBCO INC.
e. Powell Valves.
f. Red-White Valve Corporation.
g. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
h.

2. Description:

a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 300 psig.
c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
d. Ends: Threaded.
e. Stem: Bronze.
f. Disc: Solid wedge; bronze.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron.

D. Class 150, RS Bronze Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

    a. Crane Co.; Crane Valve Group; Crane Valves.
    b. Crane Co.; Crane Valve Group; Stockham Division.
    c. Hammond Valve.
    d. Kitz Corporation.
    e. Milwaukee Valve Company.
    f. NIBCO INC.
    g. Powell Valves.
    h. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
    i. Zy-Tech Global Industries, Inc.

2. Description:

    a. Standard: MSS SP-80, Type 2.
    b. CWP Rating: 300 psig.
    c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
    d. Ends: Threaded.
    e. Stem: Bronze.
    f. Disc: Solid wedge; bronze.
    g. Packing: Asbestos free.
    h. Handwheel: Malleable iron.

## 2.9 IRON GATE VALVES

A. Class 125, NRS, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

    a. Crane Co.; Crane Valve Group; Crane Valves.
    b. Crane Co.; Crane Valve Group; Jenkins Valves.
    c. Crane Co.; Crane Valve Group; Stockham Division.
    d. Flo Fab Inc.
    e. Hammond Valve.
    f. Kitz Corporation.
    g. Legend Valve.
    h. Milwaukee Valve Company.
    i. NIBCO INC.
    j. Powell Valves.
    k. Red-White Valve Corporation.
    l. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
    m. Zy-Tech Global Industries, Inc.
    n.

2. Description:

a. Standard: MSS SP-70, Type I.
b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
c. NPS 14 to NPS 24, CWP Rating: 150 psig.
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged.
f. Trim: Bronze.
g. Disc: Solid wedge.
h. Packing and Gasket: Asbestos free.

B. Class 125, OS&Y, Iron Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Flo Fab Inc.
e. Hammond Valve.
f. Kitz Corporation.
g. Legend Valve.
h. Milwaukee Valve Company.
i. NIBCO INC.
j. Powell Valves.
k. Red-White Valve Corporation.
l. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
m. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-70, Type I.
b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
c. NPS 14 to NPS 24, CWP Rating: 150 psig.
d. Body Material: ASTM A 126, gray iron with bolted bonnet.
e. Ends: Flanged.
f. Trim: Bronze.
g. Disc: Solid wedge.
h. Packing and Gasket: Asbestos free.

## 2.10 BRONZE GLOBE VALVES

A. Class 125, Bronze Globe Valves with Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. Hammond Valve.

d. Kitz Corporation.
e. Milwaukee Valve Company.
f. NIBCO INC.
g. Powell Valves.
h. Red-White Valve Corporation.
i. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
j. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-80, Type 1.
b. CWP Rating: 200 psig.
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem and Disc: Bronze.
f. Packing: Asbestos free.
g. Handwheel: Malleable iron, bronze, or aluminum.

B. Class 125, Bronze Globe Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. NIBCO INC.
d. Red-White Valve Corporation.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 200 psig.
c. Body Material: ASTM B 62, bronze with integral seat and screw-in bonnet.
d. Ends: Threaded or solder joint.
e. Stem: Bronze.
f. Disc: PTFE or TFE.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

C. Class 150, Bronze Globe Valves with Nonmetallic Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Hammond Valve.
c. Kitz Corporation.
d. Milwaukee Valve Company.
e. NIBCO INC.
f. Powell Valves.

g. Red-White Valve Corporation.
h. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
i. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-80, Type 2.
b. CWP Rating: 300 psig.
c. Body Material: ASTM B 62, bronze with integral seat and union-ring bonnet.
d. Ends: Threaded.
e. Stem: Bronze.
f. Disc: PTFE or TFE.
g. Packing: Asbestos free.
h. Handwheel: Malleable iron, bronze, or aluminum.

## 2.11 IRON GLOBE VALVES

A. Class 125, Iron Globe Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following :

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Jenkins Valves.
c. Crane Co.; Crane Valve Group; Stockham Division.
d. Hammond Valve.
e. Kitz Corporation.
f. Milwaukee Valve Company.
g. NIBCO INC.
h. Powell Valves.
i. Red-White Valve Corporation.
j. Watts Regulator Co.; a division of Watts Water Technologies, Inc.
k. Zy-Tech Global Industries, Inc.

2. Description:

a. Standard: MSS SP-85, Type I.
b. CWP Rating: 200 psig.
c. Body Material: ASTM A 126, gray iron with bolted bonnet.
d. Ends: Flanged.
e. Trim: Bronze.
f. Packing and Gasket: Asbestos free.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

### 3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install swing check valves for proper direction of flow and in horizontal position with hinge pin level.

### 3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

### 3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball, butterfly, or gate valves.
2. Throttling Service, Except Steam: Globe valves.
3. Throttling Service, Steam: Globe valves.

4. Pump-Discharge Check Valves:

    a. NPS 2 and Smaller: Bronze swing check valves with bronze or nonmetallic disc.
    b. NPS 2-1/2 and Larger: Iron swing check valves with lever and weight or with spring.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
3. For Copper Tubing, NPS 5 and Larger: Flanged ends.
4. For Steel Piping, NPS 2 and Smaller: Threaded ends.
5. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.
6. For Steel Piping, NPS 5 and Larger: Flanged ends.

## 3.5 CHILLED-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Bronze Angle Valves: Class 125 , bronze disc.
3. Ball Valves: Two piece, full port, brass or bronze with stainless-steel trim.
4. Bronze Swing Check Valves: Class 125 , bronze disc.
5. Bronze Gate Valves: Class 125 , NRS , bronze.
6. Bronze Globe Valves: Class 125 , bronze disc.

B. Pipe NPS 2-1/2 and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
2. Iron, Single-Flange Butterfly Valves, NPS 2-1/2 to NPS 12: 200 CWP, EPDM seat, aluminum-bronze disc.
3. Iron, Single-Flange Butterfly Valves, NPS 14 to NPS 24: 150 CWP, EPDM seat, aluminum-bronze disc.
4. High-Performance Butterfly Valves: Class 150 , single flange.
5. Iron Swing Check Valves: Class 125 , nonmetallic-to-metal seats.
6. 
7. Iron Gate Valves: Class 125 , .
8. Iron Globe Valves: Class 125 .

## 3.6 CONDENSER-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
2. Ball Valves: Two piece, full port, brass or bronze with stainless-steel trim.
3. Bronze Swing Check Valves: Class 125 , bronze disc.
4. Bronze Gate Valves: Class 125 , NRS .
5. Bronze Globe Valves: Class 125 , bronze disc.

B. Pipe NPS 2-1/2 and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4: May be provided with threaded ends instead of flanged ends.
2. Iron, Single-Flange Butterfly Valves, NPS 2-1/2 to NPS 12: 200 CWP, EPDM seat, aluminum-bronze stainless-steel disc.
3. High-Performance Butterfly Valves: Class 150 , single flange.
4. Iron Swing Check Valves: Class 125 , metal seats.
5. 
6. Iron Gate Valves: Class 125 , NRS .
7. Iron Globe Valves, NPS 2-1/2 to NPS 12: Class 125 .

END OF SECTION 230523

# SECTION 230553 - IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Duct labels.

### 1.2 ACTION SUBMITTAL

A. Product Data: For each type of product indicated.

## PART 2 - PRODUCTS

### 2.1 EQUIPMENT LABELS

A. Metal Labels for Equipment:

1. Material and Thickness: Stainless steel, 0.025-inch minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
3. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel self-tapping screws.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.
2. Letter Color: White .
3. Background Color: Black .
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F.
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

6. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

C. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

## 2.2 WARNING SIGNS AND LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: White .

C. Background Color: Red .

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Label Content: Include caution and warning information, plus emergency notification instructions.

## 2.3 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.

D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

## 2.4 DUCT LABELS

A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware.

B. Letter Color: White .

C. Background Color: Blue .

D. Maximum Temperature: Able to withstand temperatures up to 160 deg F.

E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.

F. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.

G. Fasteners: Stainless-steel self-tapping screws.

H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

I. Duct Label Contents: Include identification of duct service using same designations or abbreviations as used on Drawings, duct size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with duct system service lettering to accommodate both directions, or as separate unit on each duct label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches high.

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

### 3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

### 3.3 PIPE LABEL INSTALLATION

A. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

B. Pipe Label Color Schedule:

1. Chilled-Water Piping:

   a. Background Color: Green.
   b. Letter Color: White .

2. Condenser-Water Piping:

   a. Background Color: Yellow .
   b. Letter Color: White .

3. Heating Water Piping:

   a. Background Color: Red .
   b. Letter Color: White .

4. Refrigerant Piping:

   a. Background Color: Black .
   b. Letter Color: White .

5. Low-Pressure Steam Piping:

   a. Background Color: White .
   b. Letter Color: Black .

6. High-Pressure Steam Piping:

   a. Background Color: White .
   b. Letter Color: Black .

7. Steam Condensate Piping:

   a. Background Color: White .
   b. Letter Color: Black .

## 3.4 DUCT LABEL INSTALLATION

A. Install self-adhesive duct labels with permanent adhesive on air ducts in the following color codes:

   1. Blue : For cold-air supply ducts.
   2. Blue: For hot-air supply ducts.
   3. Blue: For exhaust-, outside-, relief-, return-, and mixed-air ducts.
   4. ASME A13.1 Colors and Designs: For hazardous material exhaust.

B. Locate labels near points where ducts enter into concealed spaces and at maximum intervals of 50 feet in each space where ducts are exposed or concealed by removable ceiling system.

END OF SECTION 230553

# SECTION 230593 - TESTING, ADJUSTING, AND BALANCING FOR HVAC

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Balancing Air Systems:

   a. Constant-volume air systems.
   b. Variable-air-volume systems.

2. Balancing Hydronic Piping Systems:

   a. Constant-flow hydronic systems.
   b. Variable-flow hydronic systems.

### 1.2 DEFINITIONS

A. AABC: Associated Air Balance Council.

B.

C. TAB: Testing, adjusting, and balancing.

D. TAB Specialist: An entity engaged to perform TAB Work.

### 1.3 INFORMATIONAL SUBMITTALS

A. Strategies and Procedures Plan: Within 90 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.

B. Certified TAB reports.

### 1.4 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC .

1. TAB Field Supervisor: Employee of the TAB contractor and certified by AABC .
2. TAB Technician: Employee of the TAB contractor and who is certified by AABC as a TAB technician.

B. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

C. TAB Report Forms: Use standard TAB contractor's forms approved by Engineer .

D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

E. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

F. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.7.2.3 - "System Balancing."

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and under floor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Section 233113 "Metal Ducts" Section 233116 "Nonmetal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes, and verify that they are accessible and their controls are connected and functioning.

K. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

L. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

M. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

N. Examine system pumps to ensure absence of entrained air in the suction piping.

O. Examine operating safety interlocks and controls on HVAC equipment.

P. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

## 3.2 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system-readiness checks and prepare reports. Verify the following:

1. Permanent electrical-power wiring is complete.
2. Hydronic systems are filled, clean, and free of air.
3. Automatic temperature-control systems are operational.
4. Equipment and duct access doors are securely closed.
5. Balance, smoke, and fire dampers are open.
6. Isolating and balancing valves are open and control valves are operational.
7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.

8. Windows and doors can be closed so indicated conditions for system operations can be met.

## 3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" and in this Section.

1. Comply with requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 230713 "Duct Insulation," Section 230716 "HVAC Equipment Insulation," Section 230719 "HVAC Piping Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

## 3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. For variable-air-volume systems, develop a plan to simulate diversity.

D. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

E. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

F. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

G. Verify that motor starters are equipped with properly sized thermal protection.

H. Check dampers for proper position to achieve desired airflow path.

I. Check for airflow blockages.

J. Check condensate drains for proper connections and functioning.

K. Check for proper sealing of air-handling-unit components.

L. Verify that air duct system is sealed as specified in Section 233113 "Metal Ducts."

## 3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

    a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.

2. Measure fan static pressures as follows to determine actual static pressure:

    a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.
    b. Measure static pressure directly at the fan outlet or through the flexible connection.
    c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
    d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

    a. Report the cleanliness status of filters and the time static pressures are measured.

4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
6. Obtain approval from Engineer for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur.

Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

C. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

## 3.6 PROCEDURES FOR VARIABLE-AIR-VOLUME SYSTEMS

A. Compensating for Diversity: When the total airflow of all terminal units is more than the indicated airflow of the fan, place a selected number of terminal units at a minimum set-point airflow with the remainder at maximum airflow condition until the total airflow of the terminal units equals the indicated airflow of the fan. Select the reduced-airflow terminal units so they are distributed evenly among the branch ducts.

B. Pressure-Independent, Variable-Air-Volume Systems: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Set outdoor-air dampers at minimum, and set return- and exhaust-air dampers at a position that simulates full-cooling load.
2. Select the terminal unit that is most critical to the supply-fan airflow and static pressure. Measure static pressure. Adjust system static pressure so the entering static pressure for the critical terminal unit is not less than the sum of the terminal-unit manufacturer's recommended minimum inlet static pressure plus the static pressure needed to overcome terminal-unit discharge system losses.
3. Measure total system airflow. Adjust to within indicated airflow.
4. Set terminal units at maximum airflow and adjust controller or regulator to deliver the designed maximum airflow. Use terminal-unit manufacturer's written instructions to make this adjustment. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.
5. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow the same as described for constant-volume air systems.

a. If air outlets are out of balance at minimum airflow, report the condition but leave outlets balanced for maximum airflow.

6. Remeasure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.

a. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.

7. Measure static pressure at the most critical terminal unit and adjust the static-pressure controller at the main supply-air sensing station to ensure that adequate static pressure is maintained at the most critical unit.
8. Record final fan-performance data.

C. Pressure-Dependent, Variable-Air-Volume Systems without Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Balance variable-air-volume systems the same as described for constant-volume air systems.
2. Set terminal units and supply fan at full-airflow condition.
3. Adjust inlet dampers of each terminal unit to indicated airflow and verify operation of the static-pressure controller. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.
4. Readjust fan airflow for final maximum readings.
5. Measure operating static pressure at the sensor that controls the supply fan if one is installed, and verify operation of the static-pressure controller.
6. Set supply fan at minimum airflow if minimum airflow is indicated. Measure static pressure to verify that it is being maintained by the controller.
7. Set terminal units at minimum airflow and adjust controller or regulator to deliver the designed minimum airflow. Check air outlets for a proportional reduction in airflow the same as described for constant-volume air systems.

a. If air outlets are out of balance at minimum airflow, report the condition but leave the outlets balanced for maximum airflow.

8. Measure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow.

a. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.

D. Pressure-Dependent, Variable-Air-Volume Systems with Diversity: After the fan systems have been adjusted, adjust the variable-air-volume systems as follows:

1. Set system at maximum indicated airflow by setting the required number of terminal units at minimum airflow. Select the reduced-airflow terminal units so they are distributed evenly among the branch ducts.
2. Adjust supply fan to maximum indicated airflow with the variable-airflow controller set at maximum airflow.

3. Set terminal units at full-airflow condition.
4. Adjust terminal units starting at the supply-fan end of the system and continuing progressively to the end of the system. Adjust inlet dampers of each terminal unit to indicated airflow. When total airflow is correct, balance the air outlets downstream from terminal units the same as described for constant-volume air systems.
5. Adjust terminal units for minimum airflow.
6. Measure static pressure at the sensor.
7. Measure the return airflow to the fan while operating at maximum return airflow and minimum outdoor airflow. Adjust the fan and balance the return-air ducts and inlets the same as described for constant-volume air systems.

## 3.7 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data, and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against the approved pump flow rate. Correct variations that exceed plus or minus 5 percent.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.
2. Check liquid level in expansion tank.
3. Check makeup water-station pressure gage for adequate pressure for highest vent.
4. Check flow-control valves for specified sequence of operation, and set at indicated flow.
5. Set differential-pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive-displacement type unless several terminal valves are kept open.
6. Set system controls so automatic valves are wide open to heat exchangers.
7. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.
8. Check air vents for a forceful liquid flow exiting from vents when manually operated.

## 3.8 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS

A. Measure water flow at pumps. Use the following procedures except for positive-displacement pumps:

1. Verify impeller size by operating the pump with the discharge valve closed. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.

a. If impeller sizes must be adjusted to achieve pump performance, obtain approval from Engineer and comply with requirements in Section 232123 "Hydronic Pumps."

2. Check system resistance. With all valves open, read pressure differential across the pump and mark pump manufacturer's head-capacity curve. Adjust pump discharge valve until indicated water flow is achieved.

a. Monitor motor performance during procedures and do not operate motors in overload conditions.

3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
4. Report flow rates that are not within plus or minus 10 percent of design.

B. Measure flow at all automatic flow control valves to verify that valves are functioning as designed.

C. Measure flow at all pressure-independent characterized control valves, with valves in fully open position, to verify that valves are functioning as designed.

D. Set calibrated balancing valves, if installed, at calculated presettings.

E. Measure flow at all stations and adjust, where necessary, to obtain first balance.

1. System components that have Cv rating or an accurately cataloged flow-pressure-drop relationship may be used as a flow-indicating device.

F. Measure flow at main balancing station and set main balancing device to achieve flow that is 5 percent greater than indicated flow.

G. Adjust balancing stations to within specified tolerances of indicated flow rate as follows:

1. Determine the balancing station with the highest percentage over indicated flow.
2. Adjust each station in turn, beginning with the station with the highest percentage over indicated flow and proceeding to the station with the lowest percentage over indicated flow.
3. Record settings and mark balancing devices.

H. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures including outdoor-air temperature.

I. Measure the differential-pressure-control-valve settings existing at the conclusion of balancing.

J. Check settings and operation of each safety valve. Record settings.

## 3.9 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

A. Balance systems with automatic two- and three-way control valves by setting systems at maximum flow through heat-exchange terminals and proceed as specified above for hydronic systems.

## 3.10 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass of the controller to prove proper operation. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

## 3.11 PROCEDURES FOR CHILLERS

A. Balance water flow through each evaporator and condenser to within specified tolerances of indicated flow with all pumps operating. With only one chiller operating in a multiple chiller installation, do not exceed the flow for the maximum tube velocity recommended by the chiller manufacturer. Measure and record the following data with each chiller operating at design conditions:

1. Evaporator-water entering and leaving temperatures, pressure drop, and water flow.
2. For water-cooled chillers, condenser-water entering and leaving temperatures, pressure drop, and water flow.
3. Evaporator and condenser refrigerant temperatures and pressures, using instruments furnished by chiller manufacturer.
4. Power factor if factory-installed instrumentation is furnished for measuring kilowatts.
5. Kilowatt input if factory-installed instrumentation is furnished for measuring kilowatts.
6. Capacity: Calculate in tons of cooling.
7. For air-cooled chillers, verify condenser-fan rotation and record fan and motor data including number of fans and entering- and leaving-air temperatures.

## 3.12 PROCEDURES FOR COOLING TOWERS

A. Shut off makeup water for the duration of the test, and verify that makeup and blowdown systems are fully operational after tests and before leaving the equipment. Perform the following tests and record the results:

1. Measure condenser-water flow to each cell of the cooling tower.
2. Measure entering- and leaving-water temperatures.
3. Measure wet- and dry-bulb temperatures of entering air.
4. Measure wet- and dry-bulb temperatures of leaving air.
5. Measure condenser-water flow rate recirculating through the cooling tower.
6. Measure cooling-tower spray pump discharge pressure.
7. Adjust water level and feed rate of makeup water system.
8. Measure flow through bypass.

## 3.13 PROCEDURES FOR CONDENSING UNITS

A. Verify proper rotation of fans.

B. Measure entering- and leaving-air temperatures.

C. Record compressor data.

## 3.14 PROCEDURES FOR BOILERS

A. Hydronic Boilers: Measure and record entering- and leaving-water temperatures and water flow.

B. Steam Boilers: Measure and record entering-water temperature and flow and leaving-steam pressure, temperature, and flow.

## 3.15 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each water coil:

1. Entering- and leaving-water temperature.
2. Water flow rate.
3. Water pressure drop.
4. Dry-bulb temperature of entering and leaving air.
5. Wet-bulb temperature of entering and leaving air for cooling coils.
6. Airflow.
7. Air pressure drop.

B. Measure, adjust, and record the following data for each electric heating coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperature at full load.

4. Voltage and amperage input of each phase at full load and at each incremental stage.
5. Calculated kilowatt at full load.
6. Fuse or circuit-breaker rating for overload protection.

C. Measure, adjust, and record the following data for each steam coil:

1. Dry-bulb temperature of entering and leaving air.
2. Airflow.
3. Air pressure drop.
4. Inlet steam pressure.

D. Measure, adjust, and record the following data for each refrigerant coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.
5. Refrigerant suction pressure and temperature.

## 3.16 PROCEDURES FOR TESTING, ADJUSTING, AND BALANCING EXISTING SYSTEMS

A. Perform a preconstruction inspection of existing equipment that is to remain and be reused.

1. Measure and record the operating speed, airflow, and static pressure of each fan.
2. Measure motor voltage and amperage. Compare the values to motor nameplate information.
3. Check the refrigerant charge.
4. Check the condition of filters.
5. Check the condition of coils.
6. Check the operation of the drain pan and condensate-drain trap.
7. Check bearings and other lubricated parts for proper lubrication.
8. Report on the operating condition of the equipment and the results of the measurements taken. Report deficiencies.

B. Before performing testing and balancing of existing systems, inspect existing equipment that is to remain and be reused to verify that existing equipment has been cleaned and refurbished. Verify the following:

1. New filters are installed.
2. Coils are clean and fins combed.
3. Drain pans are clean.
4. Fans are clean.
5. Bearings and other parts are properly lubricated.
6. Deficiencies noted in the preconstruction report are corrected.

C. Perform testing and balancing of existing systems to the extent that existing systems are affected by the renovation work.

1. Compare the indicated airflow of the renovated work to the measured fan airflows, and determine the new fan speed and the face velocity of filters and coils.
2. Verify that the indicated airflows of the renovated work result in filter and coil face velocities and fan speeds that are within the acceptable limits defined by equipment manufacturer.
3. If calculations increase or decrease the air flow rates and water flow rates by more than 5 percent, make equipment adjustments to achieve the calculated rates. If increase or decrease is 5 percent or less, equipment adjustments are not required.
4. Balance each air outlet.

## 3.17 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10 percent .
2. Air Outlets and Inlets: Plus or minus 10 percent .
3. Heating-Water Flow Rate: Plus or minus 10 percent .
4. Cooling-Water Flow Rate: Plus or minus 10 percent .

## 3.18 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: Prepare weekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

## 3.19 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Data for terminal units, including manufacturer's name, type, size, and fittings.
14. Notes to explain why certain final data in the body of reports vary from indicated values.
15. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water and steam flow rates.

3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Terminal units.
6. Balancing stations.
7. Position of balancing devices.

## 3.20 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional tests as may be required by the engineer to correct unusual conditions.

END OF SECTION 230593

# SECTION 230716 - HVAC EQUIPMENT INSULATION

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes insulating the following HVAC equipment that is not factory insulated:

1. Heat exchangers.
2. Chilled-water pumps.
3. Dual-service heating and cooling pumps.
4. Heating, hot-water pumps.
5. Expansion/compression tanks.
6. Air separators.

B. Related Sections:

1. Section 230713 "Duct Insulation."
2. Section 230719 "HVAC Piping Insulation."

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

### 1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

### 1.4 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Products shall not contain asbestos, lead, mercury, or mercury compounds.

B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

C. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

E. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Block Insulation: ASTM C 552, Type I.
2. Special-Shaped Insulation: ASTM C 552, Type III.
3. Board Insulation: ASTM C 552, Type IV.
4. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.

G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290,

H. High-Temperature, Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type V, without factory-applied jacket.

I. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. Provide insulation with factory-applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

J. High-Temperature, Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type III, without factory-applied jacket.

K. Mineral-Fiber, Pipe and Tank Insulation: Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied ASJ complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB. Nominal density is 2.5 lb/cu. ft. or more. Thermal conductivity (k-value) at 100 deg F is 0.29 Btu x in./h x sq. ft. x deg F or less. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

L. Polyolefin: Unicellular, polyethylene thermal plastic insulation. Comply with ASTM C 534 or ASTM C 1427, Type I, Grade 1 for tubular materials and Type II, Grade 1 for sheet materials.

M. Polystyrene: Rigid, extruded cellular polystyrene intended for use as thermal insulation. Comply with ASTM C 578, Type IV or Type XIII, except thermal conductivity (k-value) shall not exceed 0.26 Btu x in./h x sq. ft. x deg F after 180 days of aging. Fabricate shapes according to ASTM C 450 and ASTM C 585.

## 2.2 INSULATING CEMENTS

A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

## 2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.

C. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

D. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

E. Polystyrene Adhesive: Solvent- or water-based, synthetic resin adhesive with a service temperature range of minus 20 to plus 140 deg F.

F. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

G. PVC Jacket Adhesive: Compatible with PVC jacket.

## 2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.
   1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
   2. Service Temperature Range: Minus 20 to plus 180 deg F.
   3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
   4. Color: White.

C. Breather Mastic: Water based; suitable for indoor and outdoor use on above ambient services.
   1. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
   2. Service Temperature Range: Minus 20 to plus 180 deg F.
   3. Solids Content: 60 percent by volume and 66 percent by weight.
   4. Color: White.

## 2.5 SEALANTS

A. Joint Sealants:
   1. Materials shall be compatible with insulation materials, jackets, and substrates.
   2. Permanently flexible, elastomeric sealant.
   3. Service Temperature Range: Minus 100 to plus 300 deg F.
   4. Color: White or gray.
   5.

B. FSK and Metal Jacket Flashing Sealants:
   1. Materials shall be compatible with insulation materials, jackets, and substrates.
   2. Fire- and water-resistant, flexible, elastomeric sealant.
   3. Service Temperature Range: Minus 40 to plus 250 deg F.
   4. Color: Aluminum.

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:
   1. Materials shall be compatible with insulation materials, jackets, and substrates.
   2. Fire- and water-resistant, flexible, elastomeric sealant.
   3. Service Temperature Range: Minus 40 to plus 250 deg F.
   4. Color: White.

## 2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
5. PVDC Jacket for Indoor Applications: 4-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perm when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.

6. PVDC Jacket for Outdoor Applications: 6-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perm when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.

7. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.

8. Vinyl Jacket: White vinyl with a permeance of 1.3 perms when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

## 2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for equipment.

## 2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
   1. Adhesive: As recommended by jacket material manufacturer.
   2. Color: White.
   3. Factory-fabricated tank heads and tank side panels.

D. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
   1. Sheet and roll stock ready for shop or field sizing.
   2. Finish and thickness are indicated in field-applied jacket schedules.

3. Moisture Barrier for Indoor Applications: 1-mil- thick, heat-bonded polyethylene and kraft paper.
4. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
5. Factory-Fabricated Fitting Covers:

    a. Same material, finish, and thickness as jacket.
    b. Preformed two-piece or gore, 45- and 90-degree, short- and long-radius elbows.
    c. Tee covers.
    d. Flange and union covers.
    e. End caps.
    f. Beveled collars.
    g. Valve covers.
    h. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

E. Self-Adhesive Outdoor Jacket: 60-mil- thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a crosslaminated polyethylene film covered with stucco-embossed aluminum-foil facing.

F. PVDC Jacket for Indoor Applications: 4-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perm when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.

G. PVDC Jacket for Outdoor Applications: 6-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perm when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.

H. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.

## 2.9 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
1. Width: 3 inches.
2. Thickness: 11.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.
1. Width: 3 inches.

2. Thickness: 6.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
1. Width: 2 inches.
2. Thickness: 6 mils.
3. Adhesion: 64 ounces force/inch in width.
4. Elongation: 500 percent.
5. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
1. Width: 2 inches.
2. Thickness: 3.7 mils.
3. Adhesion: 100 ounces force/inch in width.
4. Elongation: 5 percent.
5. Tensile Strength: 34 lbf/inch in width.

E. PVDC Tape for Indoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.
1. Width: 3 inches.
2. Film Thickness: 4 mils.
3. Adhesive Thickness: 1.5 mils.
4. Elongation at Break: 145 percent.
5. Tensile Strength: 55 lbf/inch in width.

F. PVDC Tape for Outdoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.
1. Width: 3 inches.
2. Film Thickness: 6 mils.
3. Adhesive Thickness: 1.5 mils.
4. Elongation at Break: 145 percent.
5. Tensile Strength: 55 lbf/inch in width.

## 2.10 SECUREMENTS

A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.

B. Insulation Pins and Hangers:

1. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place.
a. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.

b. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

2. Nonmetal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate fastened to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place.
a. Baseplate: Perforated, nylon sheet, 0.030 inch thick by 1-1/2 inches in diameter.
b. Spindle: Nylon, 0.106-inch- diameter shank, length to suit depth of insulation indicated, up to 2-1/2 inches.
c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

3. Self-Sticking-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place.
a. Baseplate: Galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
b. Spindle: Copper- or zinc-coated, low-carbon steel, fully annealed, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
c. Adhesive-backed base with a peel-off protective cover.

4. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch-thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.
a. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

5. Nonmetal Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- thick nylon sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches in diameter.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

D. Wire: 0.080-inch nickel-copper alloy.

## 2.11 CORNER ANGLES

A. PVC Corner Angles: 30 mils thick, minimum 1 by 1 inch, PVC according to ASTM D 1784, Class 16354-C. White or color-coded to match adjacent surface.

B. Aluminum Corner Angles: 0.040 inch thick, minimum 1 by 1 inch, aluminum according to ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14.

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

### 3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

4. Cover inserts with jacket material matching adjacent insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

O. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

## 3.3 INSTALLATION OF EQUIPMENT, TANK, AND VESSEL INSULATION

A. Mineral-Fiber, Pipe and Tank Insulation Installation for Tanks and Vessels: Secure insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of tank and vessel surfaces.

2. Groove and score insulation materials to fit as closely as possible to equipment, including contours. Bevel insulation edges for cylindrical surfaces for tight joints. Stagger end joints.
3. Protect exposed corners with secured corner angles.
4. Install adhesively attached or self-sticking insulation hangers and speed washers on sides of tanks and vessels as follows:

    a. Do not weld anchor pins to ASME-labeled pressure vessels.
    b. Select insulation hangers and adhesive that are compatible with service temperature and with substrate.
    c. On tanks and vessels, maximum anchor-pin spacing is 3 inches from insulation end joints, and 16 inches o.c. in both directions.
    d. Do not overcompress insulation during installation.
    e. Cut and miter insulation segments to fit curved sides and domed heads of tanks and vessels.
    f. Impale insulation over anchor pins and attach speed washers.
    g. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

5. Secure each layer of insulation with stainless-steel or aluminum bands. Select band material compatible with insulation materials.
6. Where insulation hangers on equipment and vessels are not permitted or practical and where insulation support rings are not provided, install a girdle network for securing insulation. Stretch prestressed aircraft cable around the diameter of vessel and make taut with clamps, turnbuckles, or breather springs. Place one circumferential girdle around equipment approximately 6 inches from each end. Install wire or cable between two circumferential girdles 12 inches o.c. Install a wire ring around each end and around outer periphery of center openings, and stretch prestressed aircraft cable radially from the wire ring to nearest circumferential girdle. Install additional circumferential girdles along the body of equipment or tank at a minimum spacing of 48 inches o.c. Use this network for securing insulation with tie wire or bands.
7. Stagger joints between insulation layers at least 3 inches.
8. Install insulation in removable segments on equipment access doors, manholes, handholes, and other elements that require frequent removal for service and inspection.
9. Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.
10. For equipment with surface temperatures below ambient, apply mastic to open ends, joints, seams, breaks, and punctures in insulation.

B. Flexible Elastomeric Thermal Insulation Installation for Tanks and Vessels: Install insulation over entire surface of tanks and vessels.

    1. Apply 100 percent coverage of adhesive to surface with manufacturer's recommended adhesive.
    2. Seal longitudinal seams and end joints.

C. Insulation Installation on Pumps:

1. Fabricate metal boxes lined with insulation. Fit boxes around pumps and coincide box joints with splits in pump casings. Fabricate joints with outward bolted flanges. Bolt flanges on 6-inch centers, starting at corners. Install 3/8-inch-diameter fasteners with wing nuts. Alternatively, secure the box sections together using a latching mechanism.
2. Fabricate boxes from aluminum, at least 0.040 inch thick.
3. For below ambient services, install a vapor barrier at seams, joints, and penetrations. Seal between flanges with replaceable gasket material to form a vapor barrier.

## 3.4 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

C. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

D. Where PVDC jackets are indicated, install as follows:

1. Jacket can be wrapped in cigarette fashion along length of roll for insulation systems with an outer circumference of 33-1/2 inches or less. 33-1/2-inch-circumference limit allows for 2-inch- overlap seal. Using the length of roll allows for longer sections of jacket to be installed at one time. Use adhesive on the lap seal. Visually inspect lap seal for "fishmouthing," and use PVDC tape along lap seal to secure joint.
2. Repair holes or tears in PVDC jacket by placing PVDC tape over the hole or tear and wrapping a minimum of 1-1/4 circumferences to avoid damage to tape edges.

## 3.5 FINISHES

A. Equipment Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

## 3.6 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections: Inspect field-insulated equipment, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

## 3.7 BREECHING INSULATION SCHEDULE

A. Round, Exposed Breeching and Connector: High-temperature mineral-fiber blanket, 3 inches thick and 3-lb/cu. ft. nominal density.

B. Round, Concealed Breeching and Connector Insulation: High-temperature mineral-fiber blanket, 3 inches thick and 3-lb/cu. ft. nominal density.

## 3.8 EQUIPMENT INSULATION SCHEDULE

A. Insulation materials and thicknesses are identified below. If more than one material is listed for a type of equipment, selection from materials listed is Contractor's option.

B. Insulate indoor and outdoor equipment that is not factory insulated.

C. Chilled-water pump insulation shall be the following:

1. Cellular Glass: 3 inches thick.

D. Dual-service heating and cooling pump insulation shall be the following:

1. Cellular Glass: 3 inches thick.

E. Chilled-water air-separator insulation shall be the following:

1. Cellular Glass: 2 inches thick.

F. Dual-service heating and cooling air-separator insulation shall be the following:

1. Cellular Glass: 2 inches thick.

G. Heating-Hot-Water Air-Separator Insulation: Mineral-Fiber Pipe and Tank: 2 inches thick.

3.9 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Equipment, Concealed:
1. Aluminum, Stucco Embossed: 0.016 inch thick.
2.

D. Equipment, Exposed, up to 48 Inches in Diameter or with Flat Surfaces up to 72 Inches:
1.
2. Aluminum, Stucco Embossed: 0.016 inch thick.
.

E. Equipment, Exposed, Larger Than 48 Inches in Diameter or with Flat Surfaces Larger Than 72 Inches:
1. Painted Aluminum, with: 0.032 inch thick.
2. .

3.10 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Equipment, Exposed, up to 48 Inches in Diameter or with Flat Surfaces up to 72 Inches:

1. Painted Aluminum,: thick.
2. .

D. Equipment, Exposed, Larger Than 48 Inches in Diameter or with Flat Surfaces Larger Than 72 Inches:

1. Painted Aluminum, with: thick.
2. .

END OF SECTION 230716

# SECTION 230719 - HVAC PIPING INSULATION

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes insulating the following HVAC piping systems:

1. Chilled-water and brine piping, indoors and outdoors.
2. Heating hot-water piping, indoors and outdoors.
3. Refrigerant suction and hot-gas piping, indoors and outdoors.
4. Dual-service heating and cooling piping, indoors and outdoors.

B. Related Sections:

1. Section 230713 "Duct Insulation."
2. Section 230716 "HVAC Equipment Insulation."
3. Section 232113.13 "Underground Hydronic Piping" for loose-fill pipe insulation in underground piping outside the building.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.
1.

### 1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

### 1.4 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Products shall not contain asbestos, lead, mercury, or mercury compounds.

B. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

C. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

E. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide the following :

a. Pittsburgh Corning Corporation; Foamglas.

2. Block Insulation: ASTM C 552, Type I.
3. Special-Shaped Insulation: ASTM C 552, Type III.
4. Board Insulation: ASTM C 552, Type IV.
5. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
6. Factory fabricated shapes according to ASTM C 450 and ASTM C 585.

F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

1. Products: Subject to compliance with requirements, provide one of the following :

a. Aeroflex USA, Inc.; Aerocel.
b. Armacell LLC; AP Armaflex.
c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.

G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 1290, Type I.

1. Products: Subject to compliance with requirements, provide one of the following :

a. CertainTeed Corp.; SoftTouch Duct Wrap.
b. Johns Manville; Microlite.
c. Knauf Insulation; Friendly Feel Duct Wrap.
d. Manson Insulation Inc.; Alley Wrap.

e. Owens Corning; SOFTR All-Service Duct Wrap.

H. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide one of the following :

a. Fibrex Insulations Inc.; Coreplus 1200.
b. Johns Manville; Micro-Lok.
c. Knauf Insulation; 1000-Degree Pipe Insulation.
d. Manson Insulation Inc.; Alley-K.
e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
3. Type II, 1200 deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type II, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

I.

2.2 INSULATING CEMENTS

A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

1. Products: Subject to compliance with requirements, provide the following :

a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.

1. Products: Subject to compliance with requirements, provide the following :

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 81-84.

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one of the following :

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.
d. Mon-Eco Industries, Inc.; 22-25.

D. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide one of the following :

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-82.
b. Eagle Bridges - Marathon Industries; 225.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-50.
d. Mon-Eco Industries, Inc.; 22-25.

E. PVC Jacket Adhesive: Compatible with PVC jacket.

1. Products: Subject to compliance with requirements, provide one of the following :

a. Dow Corning Corporation; 739, Dow Silicone.
b. Johns Manville; Zeston Perma-Weld, CEEL-TITE Solvent Welding Adhesive.
c. P.I.C. Plastics, Inc.; Welding Adhesive.
d. Speedline Corporation; Polyco VP Adhesive.
e.

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

B. Retain subparagraph below if low-emitting materials are required. Consult mastic manufacturers to determine VOC limits.

1.

C. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

1. Products: Subject to compliance with requirements, provide one of the following :

a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
b. Vimasco Corporation; 749.

2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

D. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.

1. Products: Subject to compliance with requirements, provide one of the following :

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-10.
b. Eagle Bridges - Marathon Industries; 550.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 46-50.
d. Mon-Eco Industries, Inc.; 55-50.
e. Vimasco Corporation; WC-1/WC-5.

2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
3. Service Temperature Range: Minus 20 to plus 180 deg F.
4. Solids Content: 60 percent by volume and 66 percent by weight.
5. Color: White.

## 2.5 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass Products: Subject to compliance with requirements, provide one of the following :

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
b. Eagle Bridges - Marathon Industries; 405.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
d. Mon-Eco Industries, Inc.; 44-05.
e. Pittsburgh Corning Corporation; Pittseal 444.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Permanently flexible, elastomeric sealant.
4. Service Temperature Range: Minus 100 to plus 300 deg F.
5. Color: White or gray.

B. FSK and Metal Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following :

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
   b. Eagle Bridges - Marathon Industries; 405.
   c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 95-44.
   d. Mon-Eco Industries, Inc.; 44-05.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: Aluminum.

C. ASJ Flashing Sealants, and Vinyl, PVDC, and PVC Jacket Flashing Sealants:

1. Products: Subject to compliance with requirements, provide one of the following :

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
   b.

2. Materials shall be compatible with insulation materials, jackets, and substrates.
3. Fire- and water-resistant, flexible, elastomeric sealant.
4. Service Temperature Range: Minus 40 to plus 250 deg F.
5. Color: White.

## 2.6 FACTORY-APPLIED JACKETS

A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:

1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
4. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.

5. PVDC Jacket for Indoor Applications: 4-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perm when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.

    a. Products: Subject to compliance with requirements, provide the following :

        1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

6. PVDC Jacket for Outdoor Applications: 6-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perm when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.

    a. Products: Subject to compliance with requirements, provide the following :

        1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

7. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.

    a. Products: Subject to compliance with requirements, provide the following :

        1) Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

8. Vinyl Jacket: White vinyl with a permeance of 1.3 perms when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

## 2.7 FIELD-APPLIED FABRIC-REINFORCING MESH

A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in., in a Leno weave, for pipe.

1. Products: Subject to compliance with requirements, provide one of the following :

    a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Mast-A-Fab.
    b. Vimasco Corporation; Elastafab 894.

## 2.8 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil face, fiberglass-reinforced scrim with kraft-paper backing.

C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, provide one of the following :

   a. Johns Manville; Zeston.
   b. P.I.C. Plastics, Inc.; FG Series.
   c. Proto Corporation; LoSmoke.
   d. Speedline Corporation; SmokeSafe.
   e.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White .
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

   a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

D. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

1. Products: Subject to compliance with requirements, provide one of the following :

   a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.
   b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
   c. RPR Products, Inc.; Insul-Mate.

2. Sheet and roll stock ready for shop or field sizing .
3. Finish and thickness are indicated in field-applied jacket schedules.
4. Moisture Barrier for Indoor Applications: 2.5-mil- thick polysurlyn.
5. Moisture Barrier for Outdoor Applications: 2.5-mil- thick polysurlyn.
6. Factory-Fabricated Fitting Covers:

   a. Same material, finish, and thickness as jacket.
   b. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
   c. Tee covers.
   d. Flange and union covers.
   e. End caps.
   f. Beveled collars.
   g. Valve covers.

h. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

E. Self-Adhesive Outdoor Jacket: 60-mil- thick, laminated vapor barrier and waterproofing membrane for installation over insulation located aboveground outdoors; consisting of a rubberized bituminous resin on a crosslaminated polyethylene film covered with stucco-embossed aluminum-foil facing.

1. Products: Subject to compliance with requirements, provide the following :

a. Polyguard Products, Inc.; Alumaguard 60.

F. PVDC Jacket for Indoor Applications: 4-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.

1. Products: Subject to compliance with requirements, provide the following :

a. Dow Chemical Company (The); Saran 540 Vapor Retarder Film.

G. PVDC Jacket for Outdoor Applications: 6-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.01 perms when tested according to ASTM E 96/E 96M and with a flame-spread index of 5 and a smoke-developed index of 25 when tested according to ASTM E 84.

1. Products: Subject to compliance with requirements, provide the following :

a. Dow Chemical Company (The); Saran 560 Vapor Retarder Film.

H. PVDC-SSL Jacket: PVDC jacket with a self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip.

1. Products: Subject to compliance with requirements, provide the following :

a. Dow Chemical Company (The); Saran 540 Vapor Retarder Film and Saran 560 Vapor Retarder Film.

## 2.9 TAPES

A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following :

a. ABI, Ideal Tape Division; 428 AWF ASJ.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0836.
c. Compac Corporation; 104 and 105.

d. Venture Tape; 1540 CW Plus, 1542 CW Plus, and 1542 CW Plus/SQ.

2. Width: 3 inches.
3. Thickness: 11.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. ASJ Tape Disks and Squares: Precut disks or squares of ASJ tape.

B. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Products: Subject to compliance with requirements, provide one of the following :

a. ABI, Ideal Tape Division; 491 AWF FSK.
b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0827.
c. Compac Corporation; 110 and 111.
d. Venture Tape; 1525 CW NT, 1528 CW, and 1528 CW/SQ.
e.

2. Width: 3 inches.
3. Thickness: 6.5 mils.
4. Adhesion: 90 ounces force/inch in width.
5. Elongation: 2 percent.
6. Tensile Strength: 40 lbf/inch in width.
7. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

C. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.

1. Products: Subject to compliance with requirements, provide one of the following :

a. ABI, Ideal Tape Division; 370 White PVC tape.
b. Compac Corporation; 130.
c. Venture Tape; 1506 CW NS.

2. Width: 2 inches.
3. Thickness: 6 mils.
4. Adhesion: 64 ounces force/inch in width.
5. Elongation: 500 percent.
6. Tensile Strength: 18 lbf/inch in width.

D. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide one of the following :

a. ABI, Ideal Tape Division; 488 AWF.

b. Avery Dennison Corporation, Specialty Tapes Division; Fasson 0800.
c. Compac Corporation; 120.
d. Venture Tape; 3520 CW.

2. Width: 2 inches.
3. Thickness: 3.7 mils.
4. Adhesion: 100 ounces force/inch in width.
5. Elongation: 5 percent.
6. Tensile Strength: 34 lbf/inch in width.

E. PVDC Tape for Indoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide the following :

a. Dow Chemical Company (The); Saran 540 Vapor Retarder Tape.

2. Width: 3 inches.
3. Film Thickness: 4 mils.
4. Adhesive Thickness: 1.5 mils.
5. Elongation at Break: 145 percent.
6. Tensile Strength: 55 lbf/inch in width.

F. PVDC Tape for Outdoor Applications: White vapor-retarder PVDC tape with acrylic adhesive.

1. Products: Subject to compliance with requirements, provide the following :

a. Dow Chemical Company (The); Saran 560 Vapor Retarder Tape.
b.

2. Width: 3 inches.
3. Film Thickness: 6 mils.
4. Adhesive Thickness: 1.5 mils.
5. Elongation at Break: 145 percent.
6. Tensile Strength: 55 lbf/inch in width.

## 2.10 SECUREMENTS

A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 3/4 inch wide with wing seal or closed seal.

1. Products: Subject to compliance with requirements, provide one of the following :

a. ITW Insulation Systems; Gerrard Strapping and Seals.
b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

C. Wire: 0.062-inch soft-annealed, stainless steel .

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. C & F Wire.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.

    a. For below-ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.

3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

## 3.3 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

## 3.4 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on

insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

## 3.5 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.

3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

## 3.6 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.

2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

## 3.7 INSTALLATION OF MINERAL-FIBER PREFORMED PIPE INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.

3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

## 3.8 FIELD-APPLIED JACKET INSTALLATION

A. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

B. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

C. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

D. Where PVDC jackets are indicated, install as follows:

1. Apply three separate wraps of filament tape per insulation section to secure pipe insulation to pipe prior to installation of PVDC jacket.
2. Wrap factory-presized jackets around individual pipe insulation sections with one end overlapping the previously installed sheet. Install presized jacket with an approximate overlap at butt joint of 2 inches over the previous section. Adhere lap seal using adhesive or SSL, and then apply 1-1/4 circumferences of appropriate PVDC tape around overlapped butt joint.
3. Continuous jacket can be spiral-wrapped around a length of pipe insulation. Apply adhesive or PVDC tape at overlapped spiral edge. When electing to use adhesives, refer to manufacturer's written instructions for application of adhesives along this spiral edge to maintain a permanent bond.
4. Jacket can be wrapped in cigarette fashion along length of roll for insulation systems with an outer circumference of 33-1/2 inches or less. The 33-1/2-inch-circumference limit allows for 2-inch- overlap seal. Using the length of roll allows for longer sections of jacket to be installed at one time. Use adhesive on the lap seal. Visually inspect lap seal for "fishmouthing," and use PVDC tape along lap seal to secure joint.

5. Repair holes or tears in PVDC jacket by placing PVDC tape over the hole or tear and wrapping a minimum of 1-1/4 circumferences to avoid damage to tape edges.

3.9 FINISHES

3.10 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Engineer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to two locations of straight pipe, two locations of welded fittings, and two locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.11 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.12 INDOOR PIPING INSULATION SCHEDULE

A. Chilled Water and Brine, above 40 Deg F: Insulation shall be the following:

1. Cellular Glass: 1-1/2 inches thick.
2.

B. Heating-Hot-Water Supply and Return, 200 Deg F and Below: Insulation shall be one of the following:

1. Cellular Glass: 1-1/2 inches thick.
2. Mineral-Fiber, Preformed Pipe, Type I: 2 inches thick.

C. Refrigerant Suction and Hot-Gas Piping: Flexible elastomeric , 3/4” thick.

D. Dual-Service Heating and Cooling, 40 to 200 Deg F: Insulation shall be one of the following:

1. Cellular Glass: 1-1/2 inches thick.
2. Mineral-Fiber, Preformed Pipe, Type I: 2 inches thick.

3.13 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Chilled Water and Brine: Insulation shall be the following:

1. Cellular Glass: 2 Inches thick.

B. Heating-Hot-Water Supply and Return, 200 Deg F and Below: Insulation shall be the following:

1. Cellular Glass: 2 inches thick.

C. Refrigerant Suction and Hot-Gas Piping: Insulation shall be the following:
1. Flexible Elastomeric: 3/4” thick.

D. Dual-Service Heating and Cooling: Insulation shall be the following:

1. Cellular Glass: 2 inches thick.

3.14 OUTDOOR, UNDERGROUND PIPING INSULATION SCHEDULE

A. Chilled Water, All Sizes: Cellular glass, 2 inches thick.

B. Heating-Hot-Water Supply and Return, All Sizes, 200 Deg F and Below: Cellular glass, 3 inches thick.

C. Dual-Service Heating and Cooling, All Sizes, 40 to 200 Deg F: Cellular glass, 3 inches thick.

3.15 INDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

1. None.

D. Piping, Exposed:

1. None.
2. PVC : 20 mils thick.

3.16 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.

B. If more than one material is listed, selection from materials listed is Contractor's option.

C. Piping, Concealed:

1. None.

D. Piping, Exposed:

1. PVC: 20 mils thick.

3.17 UNDERGROUND, FIELD-INSTALLED INSULATION JACKET

A. For underground direct-buried piping applications, install underground direct-buried jacket over insulation material.

END OF SECTION 230719

# SECTION 233113 - METAL DUCTS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Rectangular ducts and fittings.
2. Round ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.
6. Seismic-restraint devices.

B. Related Sections:

1. Section 230593 "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Section 233116 "Nonmetal Ducts" for fibrous-glass ducts, thermoset fiber-reinforced plastic ducts, thermoplastic ducts, PVC ducts, and concrete ducts.
3. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

### 1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and ASCE/SEI 7.

B. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ANSI/ASHRAE 62.1.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.

7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.
13.
14.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:

    a. Luminaires.
    b. Air outlets and inlets.
    c. Speakers.
    d. Sprinklers.
    e. Access panels.
    f. Perimeter moldings.
    g. .

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

C. ASHRAE/IES Compliance: Applicable requirements in ASHRAE/IES 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

## PART 2 - PRODUCTS

### 2.1 RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

### 2.2 ROUND DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements,

materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger Than 90 inches in diameter with butt-welded longitudinal seams.

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

## 2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed ducts.

D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

E. Aluminum Sheets: Comply with ASTM B 209 Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

F. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

## 2.4 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 3 inches.
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
10. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
11. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for10-inch wg static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

## 2.5 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

## PART 3 - EXECUTION

### 3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.

K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Section 233300 "Air Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "IAQ Guidelines for Occupied Buildings Under Construction," Appendix G, "Duct Cleanliness for New Construction Guidelines."

### 3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

## 3.3 ADDITIONAL INSTALLATION REQUIREMENTS FOR COMMERCIAL KITCHEN HOOD EXHAUST DUCT

A. Install commercial kitchen hood exhaust ducts without dips and traps that may hold grease, and sloped a minimum of 2 percent to drain grease back to the hood.

B. Install fire-rated access panel assemblies at each change in direction and at maximum intervals of 20 feet in horizontal ducts, and at every floor for vertical ducts, or as indicated on Drawings. Locate access panel on top or sides of duct a minimum of 1-1/2 inches from bottom of duct.

C. Do not penetrate fire-rated assemblies except as allowed by applicable building codes and authorities having jurisdiction.

## 3.4 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts at a minimum to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Outdoor, Supply-Air Ducts: Seal Class A.
3. Outdoor, Exhaust Ducts: Seal Class C.
4. Outdoor, Return-Air Ducts: Seal Class C.
5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
7. Unconditioned Space, Exhaust Ducts: Seal Class C.
8. Unconditioned Space, Return-Air Ducts: Seal Class B.
9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class C.

10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class B.
11. Conditioned Space, Exhaust Ducts: Seal Class B.
12. Conditioned Space, Return-Air Ducts: Seal Class C.

## 3.5 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

## 3.6 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

## 3.7 DUCT CLEANING

A. Clean new and existing duct system(s) before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.

1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.
2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.

5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

## 3.8 START UP

A. Air Balance: Comply with requirements in Section 230593 "Testing, Adjusting, and Balancing for HVAC."

## 3.9 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel except as otherwise indicated and as follows:

1. Underground Ducts: Blue Duct

B. Supply Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

a. Pressure Class: Positive 2-inch wg.
b. Minimum SMACNA Seal Class: C.
c. SMACNA Leakage Class for Rectangular: 24.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Constant-Volume Air-Handling Units:

a. Pressure Class: Positive 2-inch wg.
b. Minimum SMACNA Seal Class: B.
c. SMACNA Leakage Class for Rectangular: 24.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

3. Ducts Connected to Variable-Air-Volume Air-Handling Units:

a. Pressure Class: Positive 3-inch wg.
b. Minimum SMACNA Seal Class: B.
c. SMACNA Leakage Class for Rectangular: 6.
d. SMACNA Leakage Class for Round and Flat Oval: 3.

C. Return Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

a. Pressure Class: Positive or negative 1-inch wg.
b. Minimum SMACNA Seal Class: C.

c. SMACNA Leakage Class for Rectangular: 24.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: B.
c. SMACNA Leakage Class for Rectangular: 24.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

D. Exhaust Ducts:

1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:

a. Pressure Class: Negative 1-inch wg.
b. Minimum SMACNA Seal Class: C if negative pressure, and A if positive pressure.
c. SMACNA Leakage Class for Rectangular: 24.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: B if negative pressure, and A if positive pressure.
c. SMACNA Leakage Class for Rectangular: 12 <**Insert value**>.
d. SMACNA Leakage Class for Round and Flat Oval: 6.

3. Ducts Connected to Commercial Kitchen Hoods: Comply with NFPA 96.

a. Exposed to View: Type 304, stainless-steel sheet, No. 4 finish.
b. Concealed: Carbon-steel sheet.
c. Welded seams and joints.
d. Pressure Class: Positive or negative 3-inch wg.
e. Airtight/Watertight.

4. Ducts Connected to Dishwasher Hoods:

a. Type 304, stainless-steel sheet.
b. Exposed to View: No. 4 finish.
c. Concealed: No. 2D finish.
d. Welded seams and flanged joints with watertight EPDM gaskets.
e. Pressure Class: Positive or negative 2-inch wg.
f. Airtight/Watertight.

E. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:

1. Ducts Connected to Fan Coil Units, Furnaces, Heat Pumps, and Terminal Units:

a. Pressure Class: Positive or negative 1-inch wg.
b. Minimum SMACNA Seal Class: C.

c. SMACNA Leakage Class for Rectangular: 24.
d. SMACNA Leakage Class for Round and Flat Oval: 12.

2. Ducts Connected to Air-Handling Units:

a. Pressure Class: Positive or negative 2-inch wg.
b. Minimum SMACNA Seal Class: B.
c. SMACNA Leakage Class for Rectangular: 12.
d. SMACNA Leakage Class for Round and Flat Oval: 6.

F. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.
2. PVC-Coated Ducts:

a. Exposed to Airstream: Match duct material.
b. Not Exposed to Airstream: Galvanized.

3. Stainless-Steel Ducts:

a. Exposed to Airstream: Match duct material.
b. Not Exposed to Airstream: Galvanized.

4. Aluminum Ducts: Aluminum or galvanized sheet steel coated with zinc chromate.

G. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Velocity 1000 fpm or Lower:

1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
2) Mitered Type RE 4 without vanes.

b. Velocity 1000 to 1500 fpm:

1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

c. Velocity 1500 fpm or Higher:

1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.

3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.
4) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

H. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch: Spin in.

2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.

a. Velocity 1000 fpm or Lower: 90-degree tap.
b. Velocity 1000 to 1500 fpm: Conical tap.
c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113

# SECTION 233300 - AIR DUCT ACCESSORIES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Manual volume dampers.
3. Control dampers.
4. Fire dampers.
5. Smoke dampers.
6. Flange connectors.
7. Turning vanes.
8. Duct-mounted access doors.
9. Flexible connectors.
10. Flexible ducts.
11. Duct accessory hardware.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

### 1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

## PART 2 - PRODUCTS

### 2.1 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

### 2.2 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90.
2. Exposed-Surface Finish: Mill phosphatized.

B. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and finish for exposed ducts.

C. Aluminum Sheets: Comply with ASTM B 209, Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

D. Extruded Aluminum: Comply with ASTM B 221, Alloy 6063, Temper T6.

E. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

F. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

## 2.3 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B.

1. Air Balance Inc.; a division of Mestek, Inc.
2. American Warming and Ventilating; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Greenheck Fan Corporation.
5. Lloyd Industries, Inc.
6. Nailor Industries Inc.
7. NCA Manufacturing, Inc.
8. Pottorff.
9. Ruskin Company.
10. Vent Products Company, Inc.
11. .

C. Description: Gravity balanced.

D. Maximum Air Velocity: 1000 fpm.

E. Maximum System Pressure: 2-inch wg.

F. Frame: Hat-shaped, 0.05-inch- thick, galvanized sheet steel, with welded corners or mechanically attached.

G. Blades: Multiple single-piece blades, center pivoted, maximum 6-inch width, 0.025-inch- thick, roll-formed aluminum with sealed edges.

H. Blade Action: Parallel.

I. Blade Seals: Felt.
1.

J. Tie Bars and Brackets: Galvanized steel.

K. Return Spring: Adjustable tension.

L. Bearings: Steel ball or synthetic pivot bushings.

M. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.
2. Counterweights and spring-assist kits for vertical airflow installations.
3. Electric actuators.
4. Chain pulls.

## 2.4 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Air Balance Inc.; a division of Mestek, Inc.
b. American Warming and Ventilating; a division of Mestek, Inc.
c. Flexmaster U.S.A., Inc.
d. McGill AirFlow LLC.
e. Nailor Industries Inc.
f. Pottorff.
g. Ruskin Company.
h. Trox USA Inc.
i. Vent Products Company, Inc.
j. .

2. Standard leakage rating, with linkage outside airstream.
3. Suitable for horizontal or vertical applications.
4. Frames:

a. Frame: Hat-shaped, 0.094-inch- thick, galvanized sheet steel.
b. Mitered and welded corners.
c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

a. Multiple or single blade.
b. Parallel- or opposed-blade design.
c. Stiffen damper blades for stability.

d. Galvanized-steel, 0.064 inch thick.

6. Blade Axles: Galvanized steel.
7. Bearings:

a. Oil-impregnated bronze.
b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

B. Standard, Aluminum, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2.

a. Air Balance Inc.; a division of Mestek, Inc.
b. American Warming and Ventilating; a division of Mestek, Inc.
c. McGill AirFlow LLC.
d. Nailor Industries Inc.
e. Pottorff.
f. Ruskin Company.
g. Trox USA Inc.
h. Vent Products Company, Inc.
i. .

3. Standard leakage rating, with linkage outside airstream.
4. Suitable for horizontal or vertical applications.
5. Frames: Hat-shaped, 0.10-inch- thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
6. Blades:

a. Multiple or single blade.
b. Parallel- or opposed-blade design.
c. Stiffen damper blades for stability.
d. Roll-Formed Aluminum Blades: 0.10-inch- thick aluminum sheet.
e. Extruded-Aluminum Blades: 0.050-inch- thick extruded aluminum.

7. Blade Axles: Galvanized steel.
8. Bearings:

a. Oil-impregnated bronze.
b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

9. Tie Bars and Brackets: Aluminum.

C. Jackshaft:

1. Size: 0.5-inch diameter.
2. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
3. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

D. Damper Hardware:

1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- thick zinc-plated steel, and a 3/4-inch hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

## 2.5 CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Arrow United Industries; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Greenheck Fan Corporation.
5. Lloyd Industries, Inc.
6. McGill AirFlow LLC.
7. Metal Form Manufacturing, Inc.
8. Nailor Industries Inc.
9. NCA Manufacturing, Inc.
10. Pottorff.
11. Ruskin Company.
12. Vent Products Company, Inc.
13. Young Regulator Company.
14. .

B. Frames:

1. Hat shaped.
2. 0.094-inch- thick, galvanized sheet steel.
3. Mitered and welded corners.

C. Blades:

1. Multiple blade with maximum blade width of 6 inches.
2. Blade Edging: Closed-cell neoprene.
3.

D. Blade Axles: 1/2-inch- diameter; galvanized steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.

1. Operating Temperature Range: From minus 40 to plus 200 deg F.

E. Bearings:

1. Oil-impregnated bronze.
2. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
3. Thrust bearings at each end of every blade.

## 2.6 FIRE DAMPERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Air Balance Inc.; a division of Mestek, Inc.
2. Arrow United Industries; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Greenheck Fan Corporation.
5. Nailor Industries Inc.
6. NCA Manufacturing, Inc.
7. Pottorff.
8. Prefco; Perfect Air Control, Inc.
9. Ruskin Company.
10. Vent Products Company, Inc.
11. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
12. .

B. Type: Dynamic; rated and labeled according to UL 555 by an NRTL.

C. Closing rating in ducts up to 4-inch wg static pressure class and minimum 2000-fpm velocity.

D. Fire Rating: 1-1/2 and 3 hours.

E. Frame: Curtain type with blades outside airstream; fabricated with roll-formed, 0.034-inch- thick galvanized steel; with mitered and interlocking corners.

F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.

G. Mounting Orientation: Vertical or horizontal as indicated.

H. Blades: Roll-formed, interlocking, 0.024-inch- thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- thick, galvanized-steel blade connectors.

I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

J. Heat-Responsive Device: Replaceable, 212 deg F rated, fusible links.

## 2.7 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ductmate Industries, Inc.
2. Nexus PDQ; Division of Shilco Holdings Inc.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
4. .

B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gage and Shape: Match connecting ductwork.

## 2.8 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Elgen Manufacturing.
4. METALAIRE, Inc.
5. SEMCO Incorporated.
6. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
7. .

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

E. Vane Construction: Single wall.

## 2.9 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. Ductmate Industries, Inc.
4. Elgen Manufacturing.
5. Flexmaster U.S.A., Inc.
6. Greenheck Fan Corporation.
7. McGill AirFlow LLC.
8. Nailor Industries Inc.
9. Pottorff.
10. Ventfabrics, Inc.
11. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
12. .

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."

1. Door:

    a. Double wall, rectangular.
    b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
    c. Vision panel.
    d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
    e. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Number of Hinges and Locks:

    a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
    b. Access Doors up to 18 Inches Square: Continuous and two sash locks.
    c. Access Doors up to 24 by 48 Inches: Three hinges and two compression latches.
    d. Access Doors Larger Than 24 by 48 Inches: Four hinges and two compression latches with outside and inside handles.

C. Pressure Relief Access Door:

1. Door and Frame Material: Galvanized sheet steel.

2. Door: Double wall with insulation fill with metal thickness applicable for duct pressure class.
3. Operation: Open outward for positive-pressure ducts and inward for negative-pressure ducts.
4. Factory set at 3.0- to 8.0-inch wg.
5. Doors close when pressures are within set-point range.
6. Hinge: Continuous piano.
7. Latches: Cam.
8. Seal: Neoprene or foam rubber.
9. Insulation Fill: 1-inch- thick, fibrous-glass or polystyrene-foam board.

## 2.10 DUCT ACCESS PANEL ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ductmate Industries, Inc.
2. Flame Gard, Inc.
3. 3M.
4. .

B. Labeled according to UL 1978 by an NRTL.

C. Panel and Frame: Minimum thickness 0.0528-inch carbon steel.

D. Fasteners: Carbon steel. Panel fasteners shall not penetrate duct wall.

E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.

F. Minimum Pressure Rating: 10-inch wg, positive or negative.

## 2.11 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Elgen Manufacturing.
4. Ventfabrics, Inc.
5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
6. .

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd..
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.

1. Minimum Weight: 24 oz./sq. yd..
2. Tensile Strength: 530 lbf/inch in the warp and 440 lbf/inch in the filling.
3. Service Temperature: Minus 50 to plus 250 deg F.

## 2.12 FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
4. .

B. Noninsulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire.

1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 10 to plus 160 deg F.

C. Insulated, Flexible Duct: UL 181, Class 1, aluminum laminate and polyester film with latex adhesive supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.

1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 20 to plus 210 deg F.
4. Insulation R-value: Comply with ASHRAE/IESNA 90.1.

D. Flexible Duct Connectors:

1. Clamps: Nylon strap in sizes 3 through 18 inches, to suit duct size.

## 2.13 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.

F. Install test holes at fan inlets and outlets and elsewhere as indicated.

G. Install fire dampers according to UL listing.

H. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. Upstream from duct filters.
3. At outdoor-air intakes and mixed-air plenums.
4. At drain pans and seals.
5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible

links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
7. At each change in direction and at maximum 50-foot spacing.
8. Upstream and downstream from turning vanes.
9. Upstream or downstream from duct silencers.
10. Control devices requiring inspection.
11. Elsewhere as indicated.

I. Install access doors with swing against duct static pressure.

J. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches.
2. Two-Hand Access: 12 by 6 inches.
3. Head and Hand Access: 18 by 10 inches.
4. Head and Shoulders Access: 21 by 14 inches.
5. Body Access: 25 by 14 inches.
6. Body plus Ladder Access: 25 by 17 inches.

K. Label access doors according to Division 23 Section "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

L. Install flexible connectors to connect ducts to equipment.

M.

N. Connect diffusers or light troffer boots to ducts directly or with maximum 96” lengths of flexible duct clamped or strapped in place.

O. Connect flexible ducts to metal ducts with draw bands.

P. Install duct test holes where required for testing and balancing purposes.

## 3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.

END OF SECTION 233300

# SECTION 233713.13 - AIR DIFFUSERS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:
   1. Rectangular and square ceiling diffusers.
   2. Perforated diffusers.
   3. Louver face diffusers.
   4. Linear bar diffusers.
   5. Linear slot diffusers.

B. Related Requirements:

   1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers.
   2. Section 233713.23 "Air Registers and Grilles" for adjustable-bar register and grilles, fixed-face registers and grilles, and linear bar grilles.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

## PART 2 - PRODUCTS

### 2.1 RECTANGULAR AND SQUARE CEILING DIFFUSERS

A. Devices shall be specifically designed for variable-air-volume flows.

B. Material: Aluminum.

C. Finish: Baked enamel, color selected by Architect.

D. Face Size: Reference drawing schedule

E. Face Style: Reference drawing schedule

F. Mounting: Reference drawing schedule

G. Pattern: Reference drawing schedule

H. Dampers: Reference drawing schedule

I. Accessories: Reference drawing schedule

1. Equalizing grid.
2. Plaster ring.
3. Safety chain.
4. Wire guard.
5. Sectorizing baffles.
6. Operating rod extension.

2.2 PERFORATED DIFFUSERS

A. Devices shall be specifically designed for variable-air-volume flows.

B. Material: Steel backpan and pattern controllers, with aluminum face.

C. Finish: Baked enamel, white.

D. Face Size: Reference drawing schedule

E. Duct Inlet: Round. Reference drawing schedule

F. Face Style: Reference drawing schedule

G. Mounting: Reference drawing schedule

H. Pattern Controller: Reference drawing schedule

I. Dampers: Reference drawing schedule

J. Accessories:

1. Equalizing grid.
2. Plaster ring.
3. Safety chain.
4. Wire guard.
5. Sectorizing baffles.
6. Operating rod extension.

2.3 LOUVER FACE DIFFUSERS

A.

B. Devices shall be specifically designed for variable-air-volume flows.

C. Material: Aluminum.

D. Finish: Baked enamel, white.

E. Face Size: Reference drawing schedule

F. Mounting: Reference drawing schedule

G. Pattern: Reference drawing schedule

H. Dampers: Reference drawing schedule

I. Accessories:

1. Square to round neck adaptor.
2. Adjustable pattern vanes.
3. Throw reducing vanes.
4. Equalizing grid.
5. Plaster ring.
6. Safety chain.
7. Wire guard.
8. Sectorizing baffles.
9. Operating rod extension.

2.4 LINEAR BAR DIFFUSERS

A.

B. Devices shall be specifically designed for variable-air-volume flows.

C. Material: Aluminum.

D. Finish: Baked enamel, white.

E. Narrow Core Spacing Arrangement: 1/8-inch- thick blades spaced 1/4 inch apart; 15-degree deflection.

F. Wide Core Spacing Arrangement: 1/8-inch- thick blades spaced 1/2 inch apart; 15-degree deflection.

G. Wide Core Spacing Arrangement: 3/16-inch- thick blades spaced 1/2 inch apart; 15-degree deflection.

H. Pencil-Proof Core Spacing Arrangement: 3/16-inch- thick blades spaced 7/16 inch apart; 15-degree deflection.

I. Frame: Reference drawing schedule

J. Mounting Frame: Reference drawing schedule

K. Mounting: Reference drawing schedule

L. Damper Type: Reference drawing schedule

M.

2.5 LINEAR SLOT DIFFUSERS

A.

B. Devices shall be specifically designed for variable-air-volume flows.

C. Material - Shell: Aluminum,

D. Material - Pattern Controller and Tees: Aluminum.

E. Finish - Face and Shell: Baked enamel, black.

F. Finish - Pattern Controller: Baked enamel, black.

G. Finish - Tees: Baked enamel, white.

H. Slot Width: Reference drawing schedule

I. Number of Slots: Reference drawing schedule

J. Length: Reference drawing schedule

K. Accessories: Reference drawing schedule

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install diffusers level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

A. After installation, adjust diffusers to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713.13

# SECTION 233713.23 - REGISTERS AND GRILLES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Adjustable blade face registers and grilles.
2. Fixed face registers and grilles.

B. Related Requirements:

1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to registers and grilles.
2. Section 233713.13 "Air Diffusers" for various types of air diffusers.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

## PART 2 - PRODUCTS

### 2.1 REGISTERS

A. Adjustable Blade Face Register:

B. Material: Aluminum.
1. Finish: Baked enamel, white.
2. Face Blade Arrangement: Reference drawing schedule
3. Core Construction: Reference drawing schedule
4. Rear-Blade Arrangement: Reference drawing schedule
5. Frame: Reference drawing schedule
6. Mounting Frame: Reference drawing schedule
7. Mounting: Reference drawing schedule
8. Damper Type: Reference drawing schedule

### 2.2 GRILLES

A. Adjustable Blade Face Grille:
1. Material: Aluminum.
2. Finish: Baked enamel, white.
3. Face Blade Arrangement: Reference drawing schedule
4. Core Construction: Reference drawing schedule

5. Rear-Blade Arrangement: Reference drawing schedule
6. Frame: Reference drawing schedule
7. Mounting Frame: Reference drawing schedule
8. Mounting: Reference drawing schedule

B. Fixed Face Grille:
1. Material: Aluminum.
2. Finish: Baked enamel, white.
3. Face Blade Arrangement:
4. Face Arrangement: Perforated core.
5. Core Construction: Reference drawing schedule
6. Frame:. Reference drawing schedule
7. Mounting FrameReference drawing schedule: Reference drawing schedule
8. Mounting:

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Install registers and grilles level and plumb.

B. Outlets and Inlets Locations: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install registers and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

### 3.2 ADJUSTING

A. After installation, adjust registers and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713.23

# SECTION 260000 - ELECTRICAL REQUIREMENTS

## PART 1 - GENERAL

### 1.1 SCOPE OF WORK

A. The general provisions of the Contract, including General Conditions, General Requirements, and Division 1 of the Specifications, apply to all Sections of Division 26.

B. Other Contract Documents complement the requirements and apply to the work of Division 26.

C. All facilities, supervision, coordination, transportation, handling, labor and methods for the fabrication, installation, interconnections, painting and other finishes, start-up, tests, adjustments, clean-up and other necessary work for the complete and satisfactory systems and equipment, ready for operation and use, shall be included.

D. Whenever the words "Contractor" appear in this Division, they refer to the Contractor responsible for work specified in that Section.

E. The Contractor shall examine all Contract Documents including all drawings, all sections of the Specifications, Electrical, HVAC, Plumbing, Fire Alarm, and Fire Protection System Design Details, and shall be responsible for ascertaining to what extent all those documents, drawings, sections of specifications, design requirements, and system design details affect work herein specified.

F. Report all errors, omissions, conflicts or code violations to Engineer and Owner prior to commencement of work.

### 1.2 GENERAL CONDITIONS

A. Where the requirements of this section and any other Division 26, 27, or 28 section are in conflict with the requirements of Division 01 work, the more stringent requirement shall be followed.

B. Where the requirements of this section and any other Division 26, 27, or 28 section are in conflict with the Drawings, the more stringent requirement shall be followed.

C. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Engineer for a decision before proceeding.

D. Industry Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

E. Unless provided with dimensions or noted otherwise, electrical plans are strictly diagrammatic only. Refer to the Architectural drawings for all dimensions, mounting heights, etc. Effort has been made to properly account for all space requirements, clearances, etc. but site conditions

and products selected may vary. It shall be the Contractor's responsibility to maintain proper arrangement and clearances. Drawings shall not be scaled.

F. Because of the scale of the drawings, certain basic items such as conduit fittings, access panels, sleeves, pull and junction boxes may not be shown.

G. Contract documents show design basis equipment.

H. The Contractor shall pay all fees, obtain required permits and coordinate inspections as required by the Authority Having Jurisdiction.

I. Codes and Standards: All work shall be in compliance with all applicable Laws, Codes, Standards, and Regulations of Governmental Bodies having jurisdiction over work performed at the applicable job site.

1.3 DEFINITIONS

A. CONDUIT: As used in these documents, means conduit, fittings, elbows, unions, specialties, accessories and appurtenances necessary for, or incidental to, a complete system.

B. PROVIDE: As used in these documents, means to furnish and install. The words "furnish" "include" or "install" used in the Specifications or on the Drawings, means to deliver to the job site or to install and test complete and ready for operation systems and items mentioned. The word “install” shall also apply to equipment furnished by others, including Owner purchased equipment. Any item indicated either in the Specification or on the Drawings shall be included in the Work.

C. CONCEALED WORK: As used herein refers to conduit, wiring, and accessories above solid material ceilings and within walls, partitions, shafts, service spaces, underground, or not normally exposed to view and enclosed on all sides by finish materials. Access to conduit and wiring would demolish finish materials.

D. CONCEALED BUT ACCESSIBLE: As used in these documents, refers to conduit, wiring, and accessories accessible above or through suspended ceilings, in walls at access panels or in chases with access doors.

E. EXPOSED WORK: Refers to conduit, wiring or equipment normally exposed to view within rooms or open area. Consider conduit, wiring, or equipment in mechanical or electrical equipment rooms as “Exposed Work”, unless noted otherwise on the plans.

1.4 DEFINITION OF THE WORK

A. Electrical work is specified in the following applicable sections of Division 26, 27, and 28:

PRODUCT DATA SHEET 1 -

PRODUCT DATA SHEET 2 -

A. 260519 Low Voltage Electrical Power Conductors and Cables

B. 260000 Electrical Requirements

C. 260519 Low-Voltage Electrical Power Conductors And Cables

D. 260526 Grounding and Bonding for Electrical Systems

E. 260529 Hangers and Supports for Electrical Systems

F. 260533 Raceways and Boxes for Electrical Systems

G. 260544 Sleeves and Sleeve Seals for Electrical Raceways and Cabling

H. 260553 Identification for Electrical Systems

I. 260923 Lighting Control Devices

J. 261000 Electric Utility Services

K. 262413 Switchboards

L. 262416 Panelboards

M. 262713 Electricity Metering

N. 262716 Electrical Cabinets and Enclosures

O. 262726 Wiring Devices

P. 262816 Enclosed Switches and Circuit Breakers

Q. 265100 Interior Lighting

R. 265600 Exterior Lighting

S. 283111 Digital, Addressable Fire-Alarm System

1.2 QUALITY ASSURANCE / CONTROL

A. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.
   1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
      a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
   2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
   3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written electronic report of each quality-control service.

4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a manufacturer's representative to observe and inspect the Work. Manufacturer's representative's services include examination of substrates and conditions, verification of materials, inspection of completed portions of the Work, and submittal of written reports.

D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

## 1.3 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.

B. Delivery and Handling:
1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:
1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

## 1.4 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
3. Refer to other Sections for specific content requirements and particular requirements for submitting special warranties.

## 1.5 UNIT PRICES

A. Unit price is a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.
1. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
2. Measurement: See individual Specification Sections or Drawings for work that requires establishment of unit prices.

## 1.6 ALTERNATES

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.
2. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
a. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

## 1.7 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, plumbing, and electrical systems.

b. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Engineer indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid.
2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings.
3. Electrical Rooms: Provide coordination drawings for the main electrical room showing plans and elevations of electrical equipment, conduit sizes over 1”, duct and piping of foreign systems, and fire-alarm equipment.
4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Review: Engineer will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility.

## 1.8 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the format specified.
1. Engineer will return RFIs submitted to Engineer by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect.
6. Name of Engineer.
7. RFI number, numbered sequentially.
8. RFI subject.
9. Specification Section number and title and related paragraphs, as appropriate.
10. Drawing number and detail references, as appropriate.
11. Field dimensions and conditions, as appropriate.
12. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
13. Contractor's signature.
14. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

C. Engineer’s Action: Engineer will review each RFI, determine action required, and respond. Allow five business days for Engineer's response for each RFI. Receipt by Architect prior to receipt by Engineer will not be included in time allotted for response. RFIs received by Engineer after 1:00 p.m. will be considered as received the following working day.

1.9 SUBMITTALS

A. Definitions
1. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action.
2. Informational Submittals: Written and graphic information and physical samples that do not require Engineer's responsive action. Submittals may be rejected for not complying with requirements.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
a. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 10 business days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 5 business days for review of each resubmittal.

D. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form. Similar equipment shall be submitted in one complete submittal package (i.e., all panelboards, all light fixtures, all fire alarm devices).
2. Name file with submittal number or other unique identifier, including revision identifier.
a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., PBHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., PBHS-061000.01.A).
3. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner**,** containing the following information:
a. Project name.
b. Date.
c. Name and address of Architect.
d. Name and address of Engineer.
e. Name of Contractor.
f. Name of Sub-Contractor.

g. Name of firm or entity that prepared submittal.
h. Names of subcontractor, manufacturer, and supplier.
i. Category and type of submittal.
j. Submittal purpose and description.
k. Specification Section number and title.
l. Specification paragraph number or drawing designation and generic name for each of multiple items.
m. Drawing number and detail references, as appropriate.
n. Location(s) where product is to be installed, as appropriate.
o. Related physical samples submitted directly.
p. Indication of full or partial submittal.
q. Transmittal number.
r. Submittal and transmittal distribution record.
s. Specification section indicating Compliance/Non-Compliance to all paragraphs and sub-paragraphs.
t. Other necessary identification.
u. Remarks.

E. Contractor's Certification Statement
1. For each submittal, the Contractor shall be required to identify compliance or non-compliance for each paragraph of the submittal.
a. Where the Contractor will comply with the specifications, they shall mark "C" next to the paragraph.
b. Where the Contractor will not comply with the specification, they shall mark "NC" next to the paragraph.
1) Where the Contractor marks "NC," reasons shall be given for the non-compliance and how the intention of the design is to be met, substitutions, etc.
c. Where a paragraph is marked with "C" or "NC", any sub-paragraphs of the paragraph without a mark shall be considered to have the same status.
2. Submittals without the certification statement shall be returned "resubmit."

F. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Engineer's action stamp.

G. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

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

## PART 2 - PRODUCTS

### 2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements:
1. Submit electronic submittals as PDF.

2. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
    a. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
    a. Manufacturer's catalog cuts.
    b. Manufacturer's product specifications.
    c. Standard color charts.
    d. Statement of compliance with specified referenced standards.
    e. Testing by recognized testing agency.
    f. Application of testing agency labels and seals.
    g. Notation of coordination requirements.
    h. Availability and delivery time information.
4. For equipment, include the following in addition to the above, as applicable:
    a. Wiring diagrams showing factory-installed wiring.
    b. Printed performance curves.
    c. Operational range diagrams.
    d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
5. Submit Product Data before or concurrent with Samples.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    a. Identification of products.
    b. Schedules.
    c. Compliance with specified standards.
    d. Notation of coordination requirements.
    e. Notation of dimensions established by field measurement.
    f. Relationship and attachment to adjoining construction clearly indicated.
    g. Seal and signature of professional engineer if specified.
2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 30 by 42 inches.

## 2.2 GENERAL CONDITIONS

A. Each system component installed by Contractor shall meet or exceed the performance specification requirements listed in the Contract Documents including drawings, specifications, Electrical and Fire Alarm Design Requirements and Design Details.
1. Components with a lesser degree of performance or quality as determined by the Owner, Building Department, design A/E or documented as inferior is not acceptable, and Contractor shall replace with no additional charge to Owner.

B. Materials and equipment shall be new, unused unless otherwise noted, standard current products from manufacturers regularly engaged in the production of such equipment and shall

bear label of the Underwriters' Laboratory for the intent use or shall be materials approved by the code-enforcing agency.

C. Where two or more units of the same class of equipment or material are required, these shall be the product of a single manufacturer throughout entire project and shall fit in the allocated spaces provided, complying with all clearances and codes.

D. All hardware and accessory fittings shall be a type designed, intended or appropriate for use, be compatible, and compliment the item with which they are used.
1. They shall have corrosion protection suitable for atmosphere they are installed.
2. All such hardware shall be U.S. standard size.

E. All materials including insulation, jackets, and adhesives shall have a Flame Spread Rating not exceeding 25, and Smoke Developed Rating not exceeding 50, when tested in accordance with NFPA 255, "Methods of Test of Surface Burning Characteristics of Building Materials."
1. Submittal data shall specifically indicate those ratings.

F. Use materials and equipment fabricated in the United States of America and labeled accordingly, when possible, for all piping materials.
1. Provide documentation from a U.S. testing laboratory, certified by Florida Engineer that the product delivered to the site meets the DMS requirements (ASTM standards).

G. All equipment and conduit supports shall be hot dipped galvanized except as otherwise noted in Contract Documents.
1. Do not use copper clad hangers.

H. Follow installations directions and recommendations of material and equipment manufacturers.

## 2.3 COMPARABLE PRODUCTS

A. Conditions for Consideration: Engineer will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Engineer may return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Shall not adversely affect the project’s time schedule.
6. Samples, if requested.

B. Any substitutions resulting in added cost shall be at the Contractor’s expense, including any indirect expenses.

C. Failure to follow the approval procedure may result in the forced removal of all work performed prior to approval.

## PART 3 - EXECUTION

### 3.1 GENERAL

A. Florida Licensed Contractors shall perform construction work.
   1. The Contractor shall not work outside the scope of his license.
   2. Any person who is not licensed must work under direct supervision of a person who has a license required by the state law and by the county or municipal licensing ordinances.
   3. The job supervisor must speak English and must have 10-years experience of installing the electrical and fire alarm equipment specified in the contract documents.
   4. Workers skilled and competent in the type of work involved shall accomplish the installation.
   5. Workmanship throughout shall correspond to the standards of the best trade practices.

B. Contractor shall install all systems and equipment in accordance with the Contract Documents, and equipment or material manufacturer recommendations and instructions.

C. Work lines and established grades shall be in strict accordance with the Contract Documents.
   1. The Contractor shall furnish to all trades, in ample time, any information they need to construct all equipment bases, trenches, pits, chases, and openings in floors, walls, and finishes to provide required working clearances.
   2. The contractor shall set all sleeves, anchor bolts or inserts to fasten equipment before pouring of adjacent concrete.

D. Coordinate location of all Division 26 work with Divisions 23, 25, 27, and 28.

E. Coordinate with other Divisions to provide any necessary circuits for controls including EMCS, BMS, etc.

### 3.2 COORDINATION OF WORK AND DRAWINGS

A. Each contractor and subcontractor shall be responsible for coordinating the installation of his equipment/labor with the General Contractor and work of other Contractors and trades.
   1. The contractor shall coordinate the work of different trades to prevent interference between conduit, equipment, and structural work.

B. Contractor’s failure to coordinate work between trades using coordination shop drawings or other means will not cause for any additional cost changes to the Owner, and/or changes to the project schedule.
   1. If the contractor installs his work before coordinating with other trades or causes interference with work of other trades, the contractor shall make necessary changes in the work to correct the condition, at no additional cost to the Owner, and/or changes to the project schedule.

### 3.3 EXAMINATION

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

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
4. Submittal of a bid is an acknowledgement that the Contractor performed the site inspection and has no conflicts with performing the work.
    a. Submittal of bid shall indicate that the Contractor has included all required allowances in the bid.

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

## 3.4 PREPARATION

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

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

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

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to the Engineer.

## 3.5 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.
1. Contractor shall be required to coordinate provisions for temporary service with the Utility.
2. The Contractor shall be responsible for installation, operation, maintenance, and removal of each temporary service.

B. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.

3.6 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
   1. Make vertical work plumb and make horizontal work level.
   2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
   3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.

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

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

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

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

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

G. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
   1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
   2. Allow for building movement, including thermal expansion and contraction. Expansion fittings shall be provided at all building expansion joints or where needed to allow for thermal expansion.
   3. Coordinate installation of anchorages. A minimum of two bolts are required per each piece of equipment. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
   4. Installation shall be in accordance with FBC 423.14.7.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

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

J. Wiring and Electrical Work for HVAC Equipment
   1. All electrical work for HVAC connections shall comply with NFPA 70.
   2. A standard wiring color code shall be established for each electrical and control component of the system and all similar devices shall be wired alike, maintaining the established color code throughout the entire project.
   3. The Mechanical Contractor, unless specified otherwise, shall furnish all Division 23 equipment, complete with motors and controls.
      a. The Mechanical Contractor shall set the motors in place.

b. Some low power single-phase equipment may be furnished with unit mounted disconnects.

4. Division 26 shall provide power services for motors and equipment furnished by Division 23 to include safety disconnect switches, (except unit mounted disconnects), motor starters, wiring and final connections.

K. Corrosion:
1. Make provisions to prevent corrosion due to contact of metallic conduit and equipment with moisture or dissimilar materials.
2. When joining a conduit with another conduit, fitting, or piece of equipment constructed of dissimilar metal install an insulated joint to prevent formation of galvanic couple.
3. Conduit hangers and supports of dissimilar metal shall be isolated from contact with conduit.
4. Metal conduit and equipment shall be isolated from direct contact with concrete or other corrosive materials and soils.

## 3.7 MATERIALS

A. Access Panels: Contractor shall provide required access panels or doors for all serviceable equipment in concealed locations whether or not called for on the drawings.

B. Access and Service Space: Provide clearances, service space, and access to appliances and equipment in rooms, attics, under floors, on roofs or elevated structures or on sloped roofs in accordance with NFPA 70.

C. Escutcheons:
1. Provide chrome-plated escutcheons at each sleeve opening into finished spaces.
2. Where sleeve extends above finished floor, escutcheon shall be high cap type and shall clear sleeve extension.

D. Sleeves:
1. Sleeves are required for all conduit passing through masonry or concrete partitions (walls, floors ceilings, roofs) and through concrete beams, foundations, and footings.
   a. Position sleeves in formwork prior to placement of concrete.
   b. Provide concrete reinforcing around sleeves.
2. Sleeves for conduit passing through non-load bearing or non-fire or smoke rated walls and partitions may be required if included in the design documents by the Engineer.
   a. When required, sleeves shall be galvanized sheet steel with lock seam joints of minimum gauges as follows: pipes 2½" and smaller - 24 gage; 3" to 6" - 22 gage; over 6" - 20 gage.
3. Sleeves for piping passing through load bearing walls, concrete beams, foundations, footings and waterproof floors shall be Schedule 40 galvanized steel pipe or 18 gage galvanized sheet steel.
4. In finished areas where conduits are exposed, terminate sleeves flush with wall, partitions, and ceilings, and shall extend ½" above finished floor level.
   a. Extend sleeves 1" above finished floors in areas likely to entrap water.
   b. Caulk floor sleeves.
5. Flash sleeves passing through waterproofing membrane as required by Division 7.
6. Protect conduit penetrations through fire-rated partitions (walls, floors, or ceilings) in per with FBC.
   a. Protected penetration shall retain the original integrity of the fire rated partition.
   b. Unprotected penetrations through fire-rated partitions are not allowed.

c. All materials, products, and procedures used to complete the fire stopping assemblies must be tested, listed, and approved by testing laboratories such as U.L. or Factory Mutual and comply with requirements of ASTM-E-119.
d. Securely fasten sleeves to the partition that are part of the required approved fire stopping.
e. Close off annular spaces between sleeves and pipes, and between penetrating item and adjacent work with UL listed and approved fire stopping materials and caulk airtight.
f. Insulation and coverings shall not penetrate the fire-rated partition unless it is part of the approved U.L or Factory Mutual fire-stopping assembly.
g. Provide close fitting metal collar or escutcheon covers at both sides of penetration.

## 3.8 CUTTING AND PATCHING

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

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

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

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

E. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

F. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
3. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

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

## 3.9 CLEANING

A. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
1. Remove labels that are not permanent.
2. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
3. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
4. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
5. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
6. Leave Project clean and ready for occupancy.
7. Vacuum clean outlet boxes, electrical cabinets, and other similar equipment.

## 3.10 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
   a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

## 3.11 OPERATION AND MAINTENANCE DATA

A. Within 30 days after the date of system acceptance, record drawings of the actual installation shall be provided to the building owner, including a single-line diagram of the building electrical distribution system and floor plans indicating location and area served for all distribution.

B. An operation manual shall be provided to the building owner including the following:
   1. Content:
      a. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
      b. Performance and design criteria if Contractor is delegated design responsibility.
      c. Operating standards.
      d. Operating procedures.
      e. Operating logs.
      f. Wiring diagrams.
      g. Control diagrams.
      h. Piped system diagrams.
      i. Precautions against improper use.
      j. License requirements including inspection and renewal dates.
   2. Descriptions: Include the following:
      a. Product name and model number. Use designations for products indicated on Contract Documents.
      b. Manufacturer's name.
      c. Equipment identification with serial number of each component.
      d. Equipment function.
      e. Operating characteristics.
      f. Limiting conditions.
      g. Performance curves.
      h. Engineering data and tests.
      i. Complete nomenclature and number of replacement parts.
   3. Operating Procedures: Include the following, as applicable:
      a. Startup procedures.
      b. Equipment or system break-in procedures.
      c. Routine and normal operating instructions.
      d. Regulation and control procedures.
      e. Instructions on stopping.
      f. Normal shutdown instructions.
      g. Seasonal and weekend operating instructions.
      h. Required sequences for electric or electronic systems.
      i. Special operating instructions and procedures.
   4. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
   5. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

C. A maintenance manual shall be provided to the building owner including the following:
   1. Product Information: Include the following, as applicable:
      a. Product name and model number.
      b. Manufacturer's name.
      c. Material and chemical composition.
      d. Reordering information for specially manufactured products.
   2. Maintenance Procedures: Include manufacturer's written recommendations and the following:
      a. Inspection procedures.
      b. Schedule for routine cleaning and maintenance.
      c. Repair instructions.

D. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

E. An installation and user manual for the fire alarm system shall be maintained at the main fire alarm control panel.

## 3.12 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised Drawings as modifications are issued.
   1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
      a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
      b. Record data as soon as possible after obtaining it.
      c. Record and check the markup before enclosing concealed installations.
   2. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
   3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
   4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
   1. Format: as requested by the Owner.
   2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
   3. Refer instances of uncertainty to Engineer for resolution.

C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
   1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
   2. Format: Annotated PDF electronic file.
   3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
   4. Identification: As follows:
      a. Project name.
      b. Date.
      c. Designation "PROJECT RECORD DRAWINGS."
      d. Name of Architect.
      e. Name of Engineer.
      f. Name of Contractor.

## 3.13 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
   1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
   3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
   4. Note related Change Orders and record Drawings where applicable.

3.14 DEMONSTRATION AND TRAINING

A. Training of the Owner’s operation and maintenance personnel is required in cooperation with the Owner’s Representative.

B. Provide competent, factory-authorized personnel to provide instructions to personnel concerning the location, operation, and troubleshooting of the installed systems.

C. Schedule the instruction in coordination with the Owner’s Representative after submission and approval of formal training plans.

END OF SECTION 260000

# SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

B. Related Requirements:
1. Section 260523 "Control-Voltage Electrical Power Cables" for control systems communications cables and Classes 1, 2 and 3 control cables.
2. Section 271500 "Communications Horizontal Cabling" for cabling used for voice and data circuits.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

### 1.3 QUALITY ASSURANCE

A. Testing Agency Qualifications: Member company of NETA or an NRTL.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

## PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES Retain "Manufacturers" Paragraph and list of manufacturers below to require products from manufacturers listed or a comparable product from other manufacturers.

A. Aluminum and Copper Conductors: Comply with NEMA WC 70/ICEA S-95-658.

B. Conductor Insulation: Comply with NEMA WC 70/ICEA S-95-658 for Type THW-2, Type THHN-2, THWN-2, and Type XHHW-2.

C. Multiconductor Cable: Comply with NEMA WC 70/ICEA S-95-658 for armored cable, Type AC metal-clad cable and Type MC.

### 2.2 CONNECTORS AND SPLICES

A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper for feeders No. 1 AWG and smaller; copper or aluminum for feeders No. 1/0 AWG and larger. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
1. The design is based upon the use of copper conductors. The Contractor shall be allowed to substitute aluminum conductors for feeders over 100A, however the Contractor shall be responsible for coordinating increased and/or additional conduit sizes and routing required for aluminum conductors at no additional cost to the owner.
2. Conductors serving motor loads shall be copper, no exceptions.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger, except VFC cable, which shall be extra flexible stranded.

C. NM cable may be used instead of wire in conduit for all branch circuits within the living units where permitted by local authorities.

D. SER cable may be used instead of wire in conduit for tenant panel feeders from the meter center where permitted by local authorities.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THWN-2 or XHHW-2, single conductors in raceway.

B. Exposed Feeders: Type THHN-2 or THWN-2, single conductors in raceway or Type XHHW-2, single conductors in raceway.

C. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THWN-2, single conductors in raceway or Type XHHW-2, single conductors in raceway.

D. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-2 or THWN-2, single conductors in raceway.

E. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-2 or THWN-2, single conductors in raceway, Armored cable, Type AC, or Metal-clad cable, Type MC.

F. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THWN-2, single conductors in raceway or Type XHHW-2, single conductors in raceway.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

B. Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

C. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

D. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

E. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

F. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

G. Complete cable tray systems installation according to Section 260536 "Cable Trays for Electrical Systems" prior to installing conductors and cables.

H. AC and MC cable shall not be terminated at panelboards. Cable shall terminate outside of electrical closets and rooms with gutters. Conduit shall be used to connect gutters to panels.

## 3.4 CONNECTIONS

A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

B. Make splices, terminations, and taps that are compatible with conductor material.

1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

## 3.5 IDENTIFICATION

A. Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

B. Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

## 3.6 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.7 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

END OF SECTION 260519

# SECTION 260523 - CONTROL-VOLTAGE ELECTRICAL POWER CABLES

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:
   1. Control-circuit conductors.
   2. Identification products.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

### 1.3 INFORMATIONAL SUBMITTALS

A. Source quality-control reports.

B. Field quality-control reports.

## PART 2 - PRODUCTS

### 2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

### 2.2 PERFORMANCE REQUIREMENTS

A. Flame Travel and Smoke Density in Plenums: As determined by testing identical products according to NFPA 262 by a qualified testing agency. Identify products for installation in plenums with appropriate markings of applicable testing agency.

   1. Flame Travel Distance: 60 inches or less.
   2. Peak Optical Smoke Density: 0.5 or less.
   3. Average Optical Smoke Density: 0.15 or less.

B. Flame Travel and Smoke Density for Riser Cables in Non-Plenum Building Spaces: As determined by testing identical products according to UL 1666.

C. Flame Travel and Smoke Density for Cables in Non-Riser Applications and Non-Plenum Building Spaces: As determined by testing identical products according to UL 1685.
   1. Flame Resistance: Comply with NFPA 262.

2.3 CONTROL-CIRCUIT CONDUCTORS

A. Class 1 Control Circuits: Stranded copper, Type THHN-2-THWN-2 or Type XHHW-2, in raceway, complying with UL 44 or UL 83.

B. Class 2 and Class 3 Control Circuits: Stranded copper, Type THHN-2-THWN-2, in raceway or Type XHHW-2, in raceway, complying with UL 44 or UL 83.

C. Class 2 Control Circuits and Class 3 Remote-Control and Signal Circuits That Supply Critical Circuits: Circuit Integrity (CI) cable.

1. Smoke control signaling and control circuits.

PART 3 - EXECUTION

3.1 INSTALLATION OF RACEWAYS AND BOXES

A. Comply with requirements in Section 260533 "Raceways and Boxes for Electrical Systems" for raceway selection and installation requirements for boxes, conduits, and wireways as supplemented or modified in this Section.

1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.
2. Flexible metal conduit shall not be used.

B. Comply with TIA-569-B for pull-box sizing and length of conduit and number of bends between pull points.

C. Install manufactured conduit sweeps and long-radius elbows if possible.

3.2 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1 and NFPA 70.

B. General Requirements for Cabling:
1. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated terminals.
2. Cables may not be spliced.
3. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, frames, and terminals.
4. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
5. Support: Do not allow cables to lie on removable ceiling tiles.
6. Secure: Fasten securely in place with hardware specifically designed and installed so as to not damage cables.

C. Open-Cable Installation:
1. Suspend copper cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 30 inches apart.

2. Cable shall not be run through or on structural members or in contact with pipes, ducts, or other potentially damaging items. Do not run cables between structural members and corrugated panels.

3.3 REMOVAL OF CONDUCTORS AND CABLES

A. Remove abandoned conductors and cables. Abandoned conductors and cables are those installed that are not terminated at equipment and are not identified for future use with a tag.

3.4 CONTROL-CIRCUIT CONDUCTORS

A. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits; No 14 AWG.
2. Class 2 low-energy, remote-control, and signal circuits; No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm, and signal circuits; No 12 AWG.

3.5 GROUNDING

A. For low-voltage control wiring and cabling, comply with requirements in Section 260526 "Grounding and Bonding for Electrical Systems."

3.6 IDENTIFICATION

A. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.7 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
1. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.

B. End-to-end cabling will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

END OF SECTION 260523

# SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes grounding and bonding systems and equipment.

### 1.2 INFORMATIONAL SUBMITTALS

A. As-Built Data: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:

1. Test wells.
2. Ground rods.
3. Grounding arrangements and connections for separately derived systems.

B. Field quality-control reports.

### 1.3 QUALITY ASSURANCE

A. Testing Agency Qualifications: Engineer approved testing agency.

1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

C. Comply with UL 467 for grounding and bonding materials and equipment.

## PART 2 - PRODUCTS

### 2.1 SYSTEM DESCRIPTION

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with UL 467 for grounding and bonding materials and equipment.

### 2.2 CONDUCTORS

A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

2.3 CONNECTORS

A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy.

C. Bus-Bar Connectors: Mechanical type, cast silicon bronze, solderless compression -type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.4 GROUNDING ELECTRODES

A. Ground Rods: Copper-clad steel; 5/8 by 96 inches.

PART 3 - EXECUTION

3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 10 AWG and smaller, and stranded conductors for No. 8 AWG and larger unless otherwise indicated.

B. Underground Grounding Conductors: Install bare copper conductor, No. 2/0 AWG minimum.

1. Bury at least 24 inches below grade.

C. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.

D. Grounding Bus: Install in electrical equipment rooms, in rooms housing service equipment, and elsewhere as indicated.

1. Install bus horizontally, on insulated spacers 2 inches minimum from wall, 6 inches above finished floor unless otherwise indicated.
2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down; connect to horizontal bus.

E. Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
3. Connections to Ground Rods at Test Wells: Bolted connectors.
4. Connections to Structural Steel: Welded connectors.

3.2 GROUNDING AT THE SERVICE

A. Equipment grounding conductors and grounding electrode conductors shall be connected to the ground bus. Install a main bonding jumper between the neutral and ground buses.

## 3.3 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:

## 3.4 INSTALLATION

A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

B. Ground Rods: Drive rods until tops are 2 inches below finished floor or final grade unless otherwise indicated.

1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.

C. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Section 260543 "Underground Ducts and Raceways for Electrical Systems," and shall be at least 12 inches deep, with cover.

1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.

D. Grounding and Bonding for Piping:

1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.

E. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

## 3.5 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells. Make tests at ground rods before any conductors are connected.

    a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    b. Perform tests by fall-of-potential method according to IEEE 81.

4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

C. Grounding system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

E. Report measured ground resistances that exceed the following values:

1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.

F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Engineer promptly and include recommendations to reduce ground resistance.

END OF SECTION 260526

# SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes:

1. Hangers and supports for electrical equipment and systems.
2. Construction requirements for concrete bases.

### 1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design supports for multiple raceways, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.

C. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

### 1.3 ACTION SUBMITTALS

A. Product Data: For steel slotted support systems.

### 1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

### 1.5 QUALITY ASSURANCE

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

B. Comply with NFPA 70.

## PART 2 - PRODUCTS

### 2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.

1. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
2. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
3. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
4. Channel Dimensions: Selected for applicable load criteria.

B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.

C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.

E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

1. Mechanical-Expansion Anchors: Insert-wedge-type, stainless steel, for use in hardened Portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.

2. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
3. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
4. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
5. Toggle Bolts: All-steel springhead type.
6. Hanger Rods: Threaded steel.

## 2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.

B. Materials: Comply with requirements in Section 055000 "Metal Fabrications" for steel shapes and plates.

# PART 3 - EXECUTION

## 3.1 APPLICATION

A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.

B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.

C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

1. Secure raceways and cables to these supports with two-bolt conduit clamps.

D. All exterior support systems shall be at a minimum hot-dip galvanized after fabrication.
1. All exterior support systems shall be at a minimum hot-dip galvanized after fabrication.
2. For extremely corrosive environments (structures within 3 miles (5 km) of the coast), nonmetallic slotted systems such as factory-formed fiberglass resin members, fittings and accessories are required.

## 3.2 SUPPORT INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.

B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.

C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts.
6. To Light Steel: Sheet metal screws.
7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate by means that meet seismic-restraint strength and anchorage requirements.

D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

## 3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

A. Comply with installation requirements in Section 055000 "Metal Fabrications" for site-fabricated metal supports.

B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.

C. Field Welding: Comply with AWS D1.1/D1.1M.

## 3.4 CONCRETE BASES

A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.

B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements as specified in either Section 033000 "Cast-in-Place Concrete." or Section 033053 "Miscellaneous Cast-in-Place Concrete."

C. Anchor equipment to concrete base.

1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor bolts to elevations required for proper attachment to supported equipment.
3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

## 3.5 PAINTING

A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

B. Touchup: Comply with requirements in all painting specification sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

# SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Metal conduits, tubing, and fittings.
2. Nonmetal conduits, tubing, and fittings.
3. Metal wireways and auxiliary gutters.
4. Nonmetal wireways and auxiliary gutters.
5. Surface raceways.
6. Boxes, enclosures, and cabinets.

B. Related Requirements:

1. Section 280528 "Pathways for Electronic Safety and Security" for conduits, surface pathways, innerduct, boxes, and faceplate adapters serving electronic safety and security.

### 1.2 ACTION SUBMITTALS

A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.

## PART 2 - PRODUCTS

### 2.1 METAL CONDUITS, TUBING, AND FITTINGS

A. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. GRC: Comply with ANSI C80.1 and UL 6.

C. ARC: Comply with ANSI C80.5 and UL 6A.

D. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.

1. Comply with NEMA RN 1.
2. Coating Thickness: 0.040 inch, minimum.

E. EMT: Comply with ANSI C80.3 and UL 797.

F. FMC: Comply with UL 1; zinc-coated steel or aluminum.

G. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.

H. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.

1. Fittings for EMT:

    a. Material: Steel.
    b. Type: Setscrew or compression.

2. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
3. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.

## 2.2 NONMETALLIC CONDUITS, TUBING, A ND FITTINGS

A. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. ENT: Comply with NEMA TC 13 and UL 1653.

C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.

D. Continuous HDPE: Comply with UL 651B.

E. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.

## 2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

A. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1, Type 3R, or Type 4 unless otherwise indicated, and sized according to NFPA 70.

1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

## 2.4 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

A. Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Description: PVC, extruded and fabricated to required size and shape, and having snap-on cover, mechanically coupled connections, and plastic fasteners.

C. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.

2.5 SURFACE RACEWAYS

A. Listing and Labeling: Surface raceways shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Surface Metal Raceways: Galvanized steel with snap-on covers complying with UL 5.

C. Surface Nonmetallic Raceways: Two- or three-piece construction, complying with UL 5A, and manufactured of rigid PVC. Product shall comply with UL 94 V-0 requirements for self-extinguishing characteristics.

2.6 BOXES, ENCLOSURES, AND CABINETS

A. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.

B. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.

C. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.

D. Floor Boxes:
1. Listing and Labeling: Floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

E. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.

F. Paddle Fan Outlet Boxes: Nonadjustable, designed for attachment of paddle fan weighing 70 lb.

1. Listing and labeling: Paddle fan outlet boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.

I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.

J. Device Box Dimensions: 4 inches square by 2-1/8 inches deep, 4 inches by 2-1/8 inches by 2-1/8 inches deep, and other sizes as required.

K. Gangable boxes are allowed.

2.7 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. General Requirements for Handholes and Boxes:

1. Boxes and handholes for use in underground systems shall be designed and identified as defined in NFPA 70, for intended location and application.
2. Boxes installed in wet areas shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Fiberglass Handholes and Boxes: Molded of fiberglass-reinforced polyester resin, with frame and covers of reinforced concrete or fiberglass.

1. Standard: Comply with SCTE 77.
2. Configuration: Designed for flush burial with open bottom unless otherwise indicated.
3. Cover: Weatherproof, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and handhole location.
4. Cover Finish: Nonskid finish shall have a minimum coefficient of friction of 0.50.
5. Cover Legend: Molded lettering, "ELECTRIC."
6. Conduit Entrance Provisions: Conduit-terminating fittings shall mate with entering ducts for secure, fixed installation in enclosure wall.

## PART 3 - EXECUTION

### 3.1 RACEWAY APPLICATION

A. Outdoors: Apply raceway products as specified below unless otherwise indicated:

1. Exposed Conduit: GRC.
2. Concealed Conduit, Aboveground: GRC or EMT.
3. Underground Conduit: RNC, Type EPC-80-PVC or concrete encased.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
5. Boxes and Enclosures, Aboveground: NEMA 250, Type 4 or Type 4X.

B. Indoors: Apply raceway products as specified below unless otherwise indicated.

1. Exposed, Not Subject to Physical Damage: EMT.
2. Exposed and Subject to Severe Physical Damage: GRC . Raceway locations include the following:

    a. Loading dock.
    b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.

3. Concealed in Ceilings and Interior Walls and Partitions: EMT.
4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
5. Damp or Wet Locations: GRC.
6. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.

C. Minimum Raceway Size: 1/2-inch trade size.

D. Raceway Fittings: Compatible with raceways and suitable for use and location.

1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
3. EMT: Use setscrew or compression, steel fittings. Comply with NEMA FB 2.10.
4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.

E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.

F. Install surface raceways only where indicated on Drawings.

3.2 INSTALLATION

A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

B. Keep raceways at least 6 inches away from parallel runs of hot-water pipes. Install horizontal raceway runs above water piping.

C. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

D. Arrange stub-ups so curved portions of bends are not visible above finished slab.

E. Install no more than the equivalent of four 90-degree bends in any conduit run except for control wiring conduits, for which two 90-degree bends are allowed. Support within 12 inches of changes in direction.

F. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

G. Support conduit within 12 inches of enclosures to which attached.

H. Raceways Embedded in Slabs:

1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support. Secure raceways to reinforcement at maximum 10-foot intervals.
2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
3. Arrange raceways to keep a minimum of 2 inches of concrete cover in all directions.
4. Do not embed threadless fittings in concrete unless specifically approved by Architect for each specific location.
5. Change from ENT to GRC before rising above floor.

I. Stub-ups to Above Recessed Ceilings:

1. Use EMT for raceways.

2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

J. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

K. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.

L. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors.

M. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4-inch trade size and insulated throat metal bushings on 1-1/2-inch trade size and larger conduits terminated with locknuts. Install insulated throat metal grounding bushings on service conduits.

N. Install pull wires in empty raceways exceeding 10' in length. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

O. Surface Raceways:

1. Install surface raceway with a minimum 2-inchradius control at bend points.
2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.

P. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces.

Q. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:

1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
2. Where an underground service raceway enters a building or structure.
3. Where otherwise required by NFPA 70.

R. Expansion-Joint Fittings:

1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg. F and that has straight-run length that exceeds 25 feet.
2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:

   a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg. F temperature change.
   b. Outdoor Locations Exposed to Direct Sunlight: 155 deg. F temperature change.

c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg. F temperature change.

3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per degree F of temperature change for PVC conduits.
4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

S. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

1. Use LFMC in damp or wet locations.

T. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

U. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between the box and cover plate or the supported equipment and box.

V. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

W. Locate boxes so that cover or plate will not span different building finishes.

X. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.

Y. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.

Z. Set metal floor boxes level and flush with finished floor surface.

AA. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

## 3.3 INSTALLATION OF UNDERGROUND CONDUIT

A. Direct-Buried Conduit:

1. Excavate trench bottom to provide firm and uniform support for conduit. Prepare trench bottom as specified in Section 312000 "Earth Moving" for pipe less than 6 inches in nominal diameter.
2. Install backfill as specified in Section 312000 "Earth Moving."
3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within 12 inches

of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction as specified in Section 312000 "Earth Moving."

4. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment and at building entrances through floor.

    a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete for a minimum of 12 inches on each side of the coupling.
    b. For stub-ups at equipment mounted on outdoor concrete bases and where conduits penetrate building foundations, extend steel conduit horizontally a minimum of 60 inches from edge of foundation or equipment base. Install insulated grounding bushings on terminations at equipment.

5. Underground Warning Tape: Comply with requirements in Section 260553 "Identification for Electrical Systems."

## 3.4 INSTALLATION OF UNDERGROUND HANDHOLES AND BOXES

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting conduits to minimize bends and deflections required for proper entrances.

B. Unless otherwise indicated, support units on a level bed of crushed stone or gravel, graded from 1/2-inch sieve to No. 4 sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas, set so cover surface will be flush with finished grade. Set covers of other enclosures 1 inch above finished grade.

## 3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 260544 "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

## 3.6 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

## 3.7 PROTECTION

A. Protect coatings, finishes, and cabinets from damage and deterioration.

1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

# SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
2. Sleeve-seal systems.
3. Sleeve-seal fittings.
4. Grout.
5. Silicone sealants.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

## PART 2 - PRODUCTS

### 2.1 SLEEVES

A. Wall Sleeves:

1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
2. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop unless otherwise indicated.

B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.

C. Sleeves for Rectangular Openings:

1. Material: Galvanized sheet steel.
2. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

2.4 GROUT

A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000-psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.

1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.

B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

A. Comply with NECA 1.

B. Comply with NEMA VE 2 for cable tray and cable penetrations.

C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:

1. Interior Penetrations of Non-Fire-Rated Walls and Floors:

a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint.
b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.

2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.

D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:

1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.

E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

## 3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.

B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

## 3.3 SLEEVE-SEAL-FITTING INSTALLATION

A. Install sleeve-seal fittings in new walls and slabs as they are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 260544

# SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:
   1. Identification for conductors.
   2. Warning labels and signs.
   3. Instruction signs.
   4. Equipment identification labels.
   5. Miscellaneous identification products.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each electrical identification product indicated.

### 1.3 QUALITY ASSURANCE

A. Comply with ANSI A13.1.

B. Comply with NFPA 70.

C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

D. Comply with ANSI Z535.4 for safety signs and labels.

E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

## PART 2 - PRODUCTS

### 2.1 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Write-On Tags: Polyester tag, 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

   1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

D. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

E. Snap-Around, Color-Coding Bands: Slit, pretensioned, flexible, solid-colored acrylic sleeve, 2 inches long, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.

## 2.2 CONDUCTOR IDENTIFICATION MATERIALS

A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

C. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

D. Write-On Tags: Polyester tag, 0.010 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.

1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.

## 2.3 FLOOR MARKING TAPE

A. 2-inch- wide, 5-mil pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

## 2.4 WARNING LABELS AND SIGNS

A. Comply with NFPA 70 and 29 CFR 1910.145.

B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

C. Baked-Enamel Warning Signs:

1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch grommets in corners for mounting.
3. Nominal size, 7 by 10 inches.

D. Warning label and sign shall include, but are not limited to, the following legends:

1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."

2.5 INSTRUCTION SIGNS

A. Engraved, melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.

1. Engraved legend with white letters on black face.
2. Punched or drilled for mechanical fasteners.
3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 1/2 inch.

C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 1/2 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

2.6 EQUIPMENT IDENTIFICATION LABELS

A. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 1/2 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

B. Self-Adhesive, Engraved, Melamine Label: Adhesive backed, with white letters on a dark-gray background. Minimum letter height shall be 1/2 inch.

C. Stenciled Legend: In nonfading, waterproof, black ink or paint. Minimum letter height shall be 1 inch.

2.7 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.

B. Apply identification devices to surfaces that require finish after completing finish work.

C. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.

D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

E. Painted Identification: Comply with requirements in painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

A. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with a color coded system using an indelible marker or paint. System legends shall be as follows:

1. Standby Power - Orange.
2. Normal Power - Black.
3. Telephone - Yellow.
4. ATC - Blue.
5. Fire Alarm - Red.

B. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.

1. Color-Coding for Phase Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder, and branch-circuit conductors.

a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
b. Colors for 208/120-V Circuits:

1) Phase A: Black.
2) Phase B: Red.
3) Phase C: Blue.

c. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.

C. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.

D. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.

1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.

E. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless

otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

F. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Baked-enamel warning signs or Self-adhesive warning labels where screws cannot or should not penetrate substrate.

1. Comply with 29 CFR 1910.145.
2. Identify system voltage with black letters on an orange background.
3. Apply to exterior of door, cover, or other access.
4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:

    a. Power transfer switches.
    b. Controls with external control power connections.

G. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.

H. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 1/2-inch- high letters for emergency instructions at equipment used for power transfer, load shedding, etc.

I. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.

1. Labeling Instructions:

    a. Indoor Equipment: Self-adhesive, engraved, melamine label or engraved, melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch- high letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.
    b. Outdoor Equipment: Engraved, melamine label.
    c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
    d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.

END OF SECTION 260553

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Time switches.
2. Photoelectric switches.
3. Indoor occupancy sensors.

B. Related Requirements:

1. Section 262726 "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data

PART 2 - PRODUCTS

2.1 TIME SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Industries, Inc.
2. Leviton Mfg. Company Inc.
3. Tyco Electronics; ALR Brand.

B. Electronic Time Switches: Solid state, programmable, with alphanumeric display; complying with UL 917.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

2. Programs: Eight on-off set points on a 24-hour schedule and an annual holiday schedule that overrides the weekly operation on holidays.
3. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program.
4. Astronomic Time: All channels.
5. Automatic daylight savings time changeover.
6. Battery Backup: Not less than seven days reserve, to maintain schedules and time clock.

## 2.2 OUTDOOR PHOTOELECTRIC SWITCHES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Industries, Inc.
2. Intermatic, Inc.
3. NSi Industries LLC; TORK Products.
4. Tyco Electronics; ALR Brand.

B. Description: Solid state, with SPST dry contacts rated for 1800 VA, to operate connected load, complying with UL 773.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Light-Level Monitoring Range: 1.5 to 10 fc, with an adjustment for turn-on and turn-off levels within that range.
3. Time Delay: Thirty-second minimum, to prevent false operation.
4. Lightning Arrester: Air-gap type.
5. Mounting: Twist lock complying with NEMA C136.10, with base.

## 2.3 INDOOR OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Industries, Inc.
2. Hubbell Building Automation, Inc.
3. Leviton Mfg. Company Inc.
4. Lightolier Controls.
5. Lithonia Lighting; Acuity Lighting Group, Inc.
6. Lutron Electronics Co., Inc.
7. Watt Stopper.

B. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 30 minutes.
3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.

4. Power Pack: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
5. Mounting:

    a. Sensor: Suitable for mounting in any position on a standard outlet box.
    b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
    c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
7. Bypass Switch: Override the "on" function in case of sensor failure.

C. PIR Type: Ceiling mounted; detect occupants in coverage area by their heat and movement.

1. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in..
2. Detection Coverage (Corridor): Detect occupancy within 90 feet when mounted on a 10-foot- high ceiling.

D. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.
4. Activation shall require simultaneous sensing by both technologies. After activation, detection by either shall maintain "on."

## 2.4 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Industries, Inc.
2. Hubbell Building Automation, Inc.
3. Leviton Mfg. Company Inc.
4. Lightolier Controls.
5. Lithonia Lighting; Acuity Lighting Group, Inc.
6. Lutron Electronics Co., Inc.
7. Watt Stopper.

B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F.
3. Switch Rating: Not less than 800-VA fluorescent at 120 V, 1200-VA fluorescent at 277 V, and 800-W incandescent.

C. Wall-Switch Sensor:

1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 900 sq. ft..
2. Sensing Technology: PIR.
3. Switch Type: SP, field selectable automatic "on," or manual "on" automatic "off."
4. Voltage: Match the circuit voltage; passive-infrared type.
5. Concealed, field-adjustable, "off" time-delay selector at up to 30 minutes.
6. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

## 2.5 LIGHTING CONTACTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ASCO Power Technologies, LP; a division of Emerson Electric Co.
2. Eaton Corporation.
3. General Electric Company; GE Consumer & Industrial - Electrical Distribution; Total Lighting Control.
4. Square D; a brand of Schneider Electric.

B. Description: Electrically operated and electrically held, complying with NEMA ICS 2 and UL 508.

1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, and high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current).
2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
3. Enclosure: Comply with NEMA 250.
4. Provide with control and pilot devices as indicated on Drawings, matching the NEMA type specified for the enclosure.

## 2.6 CONDUCTORS AND CABLES

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than recommended by the manufacturer. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than recommended by the manufacturer. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

B. Occupancy Adjustments: When requested within 3 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.

1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.

C. Mount electrically held lighting contactors with elastomeric isolator pads to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

D. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch.

E. Identify components and power and control wiring according to Section 260553 "Identification for Electrical Systems."

### 3.2 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to evaluate lighting control devices and perform tests and inspections.

B. Perform the following tests and inspections with the assistance of a factory-authorized service representative:

1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

C. Lighting control devices will be considered defective if they do not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 260923

SECTION 261000 - ELECTRICAL UTILITY SERVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes arrangement with Utility Company for permanent electric service.

B. Underground service entrance.

1.2 SYSTEM DESCRIPTION

A. System Voltage: Voltage and configuration identified on the Construction Documents

B. System Frequency: 60 Hertz.

C. Service Entrance: As shown on the Construction Documents and coordinated with local electric service provider

1.3 SUBMITTALS

A. Shop Drawings:
1. Submit shop drawings and product data under provisions of Section 260000.
2. Submit Utility Company prepared drawings.

PART 2 - PRODUCTS

2.1 UTILITY EQUIPMENT

A. All utility related equipment shall meet the standards of the local electric service provider above all other reequipments herein.

B. Contractor is responsible for coordinating with local electric service provider to understand all scope prior to bid and work execution.

2.2 METERING EQUIPMENT

A. Meter: meter base and transformer cabinet.
1. Enclosure shall be aluminum
2. All three phase applications require a unit with an approved bypass device.
3. Sealing rings, lugs, and connectors shall be provided by the Contractor.
   a. Coordinate required lug/connector size with the designated Utility representative.
   b. The sealing ring must be approved by local power company.
4. Meters shall be approved by local power company.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Arrange with Utility Company to obtain electric service to the Project.

B. Underground: Install service entrance conduits at a depth of 24” to 30”, or at a depth as otherwise required by the Utility, from the Utility Company’s pad mounted transformer.

1. Utility Company will connect service lateral conductors to service entrance conductors.

C. Provide concrete pad transformer in accordance with the Utility Company's criteria.

D. Install conduits furnished by the Utility Company from project's property line as determined by the Utility Company.

END OF SECTION 261000

SECTION 262416 - PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes distribution panelboards and lighting and appliance branch-circuit panelboards.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For each panelboard and related equipment.

1. Include dimensioned plans, elevations, sections, and details. Show tabulations of installed devices, equipment features, and ratings.
2. Detail enclosure types and details for types other than NEMA 250, Type 1.
3. Detail bus configuration, current, and voltage ratings.
4. Short-circuit current rating of panelboards and overcurrent protective devices.
5. Include evidence of NRTL listing for series rating of installed devices.
6. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
7. Include wiring diagrams for power, signal, and control wiring.
8. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Panelboard schedules for installation in panelboards.

1.4 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA PB 1.

C. Comply with NFPA 70.

D. Comply with UL 67.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.

1. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

A. Enclosures: Flush- and surface-mounted cabinets.

1. Rated for environmental conditions at installed location.

a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
b. Outdoor, Wet and Damp Locations: NEMA 250, Type 3R stainless steel.

2. Directory Card: Inside panelboard door, mounted in transparent card holder.

B. Incoming Mains Location: As required.

C. Phase, Neutral, and Ground Buses: Hard-drawn copper, 98 percent conductivity.

D. Conductor Connectors: Suitable for use with conductor material and sizes.

1. Material: Hard-drawn copper, 98 percent conductivity.
2. Main and Neutral Lugs: Mechanical type.
3. Ground Lugs and Bus Configured Terminators: Mechanical type.
4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

E. Service Equipment Label: NRTL labeled for use as service equipment for panelboards with one or more main service disconnecting and overcurrent protective devices.

F. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

G. Panelboard Short-Circuit Current Rating: Rated for series-connected system with integral or remote upstream overcurrent protective devices and labeled by an NRTL. Include size and type of allowable upstream and branch devices, and listed and labeled for series-connected short-circuit rating by an NRTL.

H. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.

2.2 DISTRIBUTION PANELBOARDS

A. Panelboards: NEMA PB 1, power and feeder distribution type.

B. Mains: As indicated on the drawings.

C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers; plug-in circuit breakers where individual positive-locking device requires mechanical release for removal.

## 2.3 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

A. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

B. Mains: As indicated on the drawings.

C. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

D. Column-Type Panelboards: Narrow gutter extension, with cover, to overhead junction box equipped with ground and neutral terminal buses.

## 2.4 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

A. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.

1. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
3. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:

    a. Instantaneous trip.
    b. Long- and short-time pickup levels.
    c. Long- and short-time time adjustments.
    d. Ground-fault pickup level, time delay, and $I^2t$ response.

4. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
5. Ground-Fault Equipment Protection (GFEP) Circuit Breakers: Class B ground-fault protection (30-mA trip).
6. Arc-Fault Circuit Interrupter (AFCI) Circuit Breakers: Comply with UL 1699; 120/240-V, single-pole configuration.
7. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:

    a. Standard frame sizes, trip ratings, and number of poles.
    b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
    c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.
    d. Ground-Fault Protection: Remote-mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

e. Communication Capability: Circuit-breaker-mounted communication module with functions and features compatible with power monitoring and control system specified in project engineer.
f. For first subparagraph below, 120-V units trip at 55 percent or more of rated voltage; all other voltages trip at 75 percent or more of rated voltage.
g. Shunt Trip: 120-V trip coil energized from separate circuit, set to trip at 55 percent of rated voltage.
h. Handle Padlocking Device: Fixed attachment, for locking circuit-breaker handle in off position.
i. Handle Clamp: Loose attachment, for holding circuit-breaker handle in on position.

B. Fused Switch: NEMA KS 1, Type HD; clips to accommodate specified fuses; lockable handle.

1. Fuses, and Spare-Fuse Cabinet: Comply with requirements specified in Section 262813 "Fuses."

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Receive, inspect, handle, store and install panelboards and accessories according to NECA 407.

B. Mount top of trim 90 inches above finished floor unless otherwise indicated.
1. In no case shall the operating handle of the top-most switch or circuit breaker be higher than 79 inches (2000 mm) above finished floor.

C. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

D. Install overcurrent protective devices and controllers not already factory installed.

1. Set field-adjustable, circuit-breaker trip ranges.

E. Install filler plates in unused spaces.

F. Stub four 1-inch empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future.

G. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

H. Comply with NECA 1.

### 3.2 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Section 260553 "Identification for Electrical Systems."

B. Create a directory to indicate installed circuit loads and incorporating Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.

C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Receptacles, receptacles with integral GFCI, and associated device plates.
2. Weather-resistant receptacles.
3. Snap switches and wall-box dimmers.
4. Communications outlets.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
3. Leviton Mfg. Company Inc. (Leviton).
4. Pass & Seymour/Legrand (Pass & Seymour).

B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

2.3 STRAIGHT-BLADE RECEPTACLES

A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.

2.4 GFCI RECEPTACLES

A. General Description:

1. Straight blade, non-feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Cooper; VGF20.
b. Hubbell; GFR5352L.
c. Pass & Seymour; 2095.
d. Leviton; 7590.

2.5 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Single Pole:

      1) Cooper; AH1221.
      2) Hubbell; HBL1221.
      3) Leviton; 1221-2.
      4) Pass & Seymour; CSB20AC1.
   b. Three Way:

      1) Cooper; AH1223.
      2) Hubbell; HBL1223.
      3) Leviton; 1223-2.
      4) Pass & Seymour; CSB20AC3.
   c. Four Way:

      1) Cooper; AH1224.
      2) Hubbell; HBL1224.
      3) Leviton; 1224-2.
      4) Pass & Seymour; CSB20AC4.

C. Pilot-Light Switches, 20 A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Cooper; AH1221PL for 120 and 277 V.
    b. Hubbell; HBL1201PL for 120 and 277 V.
    c. Leviton; 1221-LH1.
    d. Pass & Seymour; PS20AC1RPL for 120 V.

2. Description: Single pole, with neon-lighted handle, illuminated when switch is "off."

## 2.6 DECORATOR-STYLE DEVICES

A. Convenience Receptacles: Square face, 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, and UL 498.

B. GFCI, Non-Feed-Through Type, Convenience Receptacles: Square face, 125 V, 20 A; comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and UL 943 Class A.

C. Toggle Switches, Square Face, 120/277 V, 15 A: Comply with NEMA WD 1, UL 20, and FS W-S-896.

## 2.7 COMMUNICATION DEVICES

A. Telephone Outlet:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Cooper; 3560-6.
    b. Leviton; 40649.

2. Description: Single RJ-45 jack for terminating 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e. Comply with UL 1863.

B. Combination TV and Telephone Outlet:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

    a. Cooper; 3562.
    b. Leviton; 40159.

2. Description: Single RJ-45 jack for 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e. Comply with UL 1863.Four-way switching may be added to "Control" Paragraph below after verifying availability with manufacturers.

## 2.8 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.

2. Material for Finished Spaces: Smooth, high-impact thermoplastic or 0.035-inch- thick, satin-finished, Type 302 stainless steel.
3. Material for Unfinished Spaces: Smooth, high-impact thermoplastic.
4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in wet and damp locations.

B. Wet-Location, Weatherproof While-In-Use Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.9 FINISHES

A. Device Color:

1. Wiring Devices Connected to Normal Power System: As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.

B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.

2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
8. Tighten unused terminal screws on the device.
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

1. Install outlet orientation consistently throughout entire project.

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

## 3.2 GFCI RECEPTACLES

A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

## 3.3 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Test Instruments: Use instruments that comply with UL 1436.
2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.

B. Tests for Convenience Receptacles:

1. Line Voltage: Acceptable range is 105 to 132 V.
2. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
3. Using the test plug, verify that the device and its outlet box are securely mounted.
4. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

C. Wiring device will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

END OF SECTION 262726

SECTION 262813 - FUSES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes: Cartridge fuses rated 600-V ac and less for use in enclosed switches and switchboards.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NEMA FU 1 for cartridge fuses.

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Cooper Bussmann, Inc.
2. Edison Fuse, Inc.
3. Ferraz Shawmut, Inc.
4. Littelfuse, Inc.

2.2 CARTRIDGE FUSES

A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

2.3 ACCESSORY COMPONENTS AND FEATURES

A. Spare-Fuse Cabinet: Suitably identified, wall-mounted, lockable, compartmented steel box or cabinet. Arrange for wall mounting.

PART 3 - EXECUTION

3.1 FUSE APPLICATIONS

A. Service Entrance: Class L, time delay or Class RK1, time delay.

B. Feeders: Class L, time delay, Class RK1, time delay, or Class RK5, time delay.

C. Motor Branch Circuits: Class RK5, time delay.

D. Other Branch Circuits: Class RK1, time delay.

3.2 INSTALLATION

A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

3.3 IDENTIFICATION

A. Install labels complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block and holder.

END OF SECTION 262813

# SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Fusible switches.
2. Nonfusible switches.
3. Molded-case circuit breakers (MCCBs).
4. Enclosures.

### 1.2 DEFINITIONS

A. NC: Normally closed.

B. NO: Normally open.

C. SPDT: Single pole, double throw.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated.

B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

### 1.4 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

### 1.5 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

### 1.6 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type GD, General Duty, Single Throw, 240-V ac, 800 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with cartridge fuse interiors to accommodate indicated fuses, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
4. Lugs: Suitable for number, size, and conductor material.
5. Service-Rated Switches: Labeled for use as service equipment.

2.2 NONFUSIBLE SWITCHES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. Type GD, General Duty, Single Throw, 600 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept two padlocks, and interlocked with cover in closed position.

C. Type HD, Heavy Duty, Single Throw, 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.

D. Accessories:

1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
3. Lugs: Suitable for number, size, and conductor material.

## 2.3 MOLDED-CASE CIRCUIT BREAKERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Eaton Electrical Inc.
2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
3. Siemens Energy & Automation, Inc.
4. Square D; a brand of Schneider Electric.

B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.

C. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

D. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller, and let-through ratings less than NEMA FU 1, RK-5.

E. Features and Accessories:

1. Standard frame sizes, trip ratings, and number of poles.
2. Lugs: Suitable for number, size, trip ratings, and conductor material.

## 2.4 ENCLOSURES

A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.

1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
2. Outdoor, Wet or Damp Locations: NEMA 250, Type 3R. Type 4X required if subjected to salt spray and/or sprinkler spray.
3. Kitchen Areas: NEMA 250, Type 4X.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

C. Install fuses in fusible devices.

D. Comply with NECA 1.

3.2 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Acceptance Testing Preparation:

1. Test continuity of each circuit.

C. Tests and Inspections:

1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262816

# SECTION 264313 - SURGE PROTECTION FOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section includes field-mounted SPDs for low-voltage (120 to 600 V) power distribution and control equipment.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
2. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, Inominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.

### 1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

B. Sample Warranty: For manufacturer's special warranty.

### 1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

### 1.5 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to replace or replace SPDs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 GENERAL SPD REQUIREMENTS

A. SPD with Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

C. Insert Project Note Here

D. Insert Project Note Here

E. Comply with UL 1449.

F. MCOV of the SPD shall be the nominal system voltage.

2.2 SERVICE ENTRANCE SUPPRESSOR

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Eaton Corporation.
2. GE Zenith Controls.
3. Schneider Electric Industries SAS.
4. Siemens Industry, Inc.

B. SPDs: Comply with UL 1449, Type 2.

1. SPDs with the following features and accessories:

a. Integral disconnect switch.
b. Internal thermal protection that disconnects the SPD before damaging internal suppressor components.
c. Indicator light display for protection status.

C. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 200 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.

D. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V, three-phase, four-wire circuits shall not exceed the following:

1. Line to Neutral: 1500 V for 480Y/277 V.
2. Line to Ground: 1200 V for 480Y/277 V.
3. Line to Line: 2000 V for 480Y/277 V.

E. SCCR: Equal or exceed 100 kA. Regardless of what is indicated here, if the single line diagram indicates a higher available fault current at the panel with an SPD device installed, the SCCR rating of that SPD shall exceed that value.

F. Inominal Rating: 20 kA.

2.3 ENCLOSURES

A. Indoor Enclosures: NEMA 250, Type 1.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with NECA 1.

B. Install an OCPD or disconnect as required to comply with the UL listing of the SPD. Ampacity of the conductor between the OCPD and the SPD shall not be less than the rating of the OCPD.

C. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible, and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.

D. Use crimped connectors and splices only. Wire nuts are unacceptable.

E. Complete startup checks according to manufacturer's written instructions. Energize SPDs after power system has been energized, stabilized, and tested.

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and inspections with the assistance of a factory-authorized service representative.

1. Compare equipment nameplate data for compliance with Drawings and Specifications.
2. Inspect anchorage, alignment, grounding, and clearances.
3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.

B. An SPD will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.3 DEMONSTRATION

A. Train Owner's maintenance personnel to operate and maintain SPDs.

END OF SECTION 264313

# SECTION 265100 - INTERIOR LIGHTING

## PART 1 - GENERAL

### 1.1 SUMMARY

A. Section Includes:

1. Interior lighting fixtures, lamps, and ballasts.
2. Emergency lighting units.
3. Exit signs.
4. Lighting fixture supports.

B. Related Sections:
1. Section 262726 "Wiring Devices" for manual wall-box for lamps.

### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, and finishes.

B. Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, from manufacturer.

### 1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

### 1.4 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NFPA 70.

## PART 2 - PRODUCTS

### 2.1 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.

B. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.

C. HID Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5B.

D. Metal Parts: Free of burrs and sharp corners and edges.

E. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.

F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

G. Diffusers and Globes:

1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

a. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
b. UV stabilized.

2. Glass: Annealed crystal glass unless otherwise indicated.

## 2.2 BALLASTS FOR LINEAR FLUORESCENT LAMPS

A. General Requirements for Electronic Ballasts:

1. Comply with UL 935 and with ANSI C82.11.
2. Designed for type and quantity of lamps served.
3. Ballasts shall be designed for full light output unless another BF, dimmer, or bi-level control is indicated.
4. Sound Rating: Class A.
5. Total Harmonic Distortion Rating: Less than 20 percent.
6. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
7. Lamp Current Crest Factor: 1.7 or less.

B. Luminaires controlled by occupancy sensors shall have programmed-start ballasts.

C. Electromagnetic Ballasts: Comply with ANSI C82.1; energy saving, high-power factor, Class P, and having automatic-reset thermal protection.

1. Ballast Manufacturer Certification: Indicated by label.

2. Ballast shall provide equal current to each lamp in each operating mode.

## 2.3 BALLASTS FOR COMPACT FLUORESCENT LAMPS

A. Description: Electronic-programmed rapid-start type, complying with UL 935 and with ANSI C 82.11, designed for type and quantity of lamps indicated. Ballast shall be designed for full light output unless dimmer or bi-level control is indicated:

1. Lamp end-of-life detection and shutdown circuit.
2. Automatic lamp starting after lamp replacement.

3. Sound Rating: Class A.
4. Total Harmonic Distortion Rating: Less than 20 percent.
5. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
6. Operating Frequency: 20 kHz or higher.
7. Lamp Current Crest Factor: 1.7 or less.
8. BF: 0.95 or higher unless otherwise indicated.
9. Interference: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for nonconsumer equipment.

## 2.4 EMERGENCY FLUORESCENT POWER UNIT

A. Internal Type: Self-contained, modular, battery-inverter unit, factory mounted within lighting fixture body and compatible with ballast. Comply with UL 924.

1. Emergency Connection: Not capable of being disconnected.
2. Test Push Button and Indicator Light: Visible and accessible without opening fixture or entering ceiling space.

    a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

3. Battery: Sealed, maintenance-free, nickel-cadmium type.
4. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
5. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.
6.

## 2.5 EXIT SIGNS

A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.

B. Internally Lighted Signs:
1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.

    a. Battery: Sealed, maintenance-free, nickel-cadmium type.
    b. Charger: Fully automatic, solid-state type with sealed transfer relay.
    c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
    d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

## 2.6 EMERGENCY LIGHTING UNITS

A. General Requirements for Emergency Lighting Units: Self-contained units complying with UL 924.

1. Battery: Sealed, maintenance-free, lead-acid type.
2. Charger: Fully automatic, solid-state type with sealed transfer relay.
3. Operation: Relay automatically turns lamp on when power-supply circuit voltage drops to 80 percent of nominal voltage or below. Lamp automatically disconnects from battery when voltage approaches deep-discharge level. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
4. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
5. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

## 2.7 FLUORESCENT LAMPS

A. T8 rapid-start lamps, rated 32 W maximum, nominal length of 48 inches, 2800 initial lumens (minimum), CRI 85 (minimum), color temperature as required by the Architect or Lighting Consultant, and average rated life 20,000 hours unless otherwise indicated.

B. T8 rapid-start lamps, rated 17 W maximum, nominal length of 24 inches, 1300 initial lumens (minimum), CRI 85 (minimum), color temperature as required by the Architect or Lighting Consultant, and average rated life of 20,000 hours unless otherwise indicated.

C. Compact Fluorescent Lamps: 4-Pin, CRI 85 (minimum), color temperature as required by the Architect, average rated life of 10,000 hours at three hours operation per start unless otherwise indicated.

1. 13 W: T4, double or triple tube, rated 900 initial lumens (minimum).
2. 18 W: T4, double or triple tube, rated 1200 initial lumens (minimum).
3. 26 W: T4, double or triple tube, rated 1800 initial lumens (minimum).
4. 32 W: T4, triple tube, rated 2400 initial lumens (minimum).
5. 42 W: T4, triple tube, rated 3200 initial lumens (minimum).

## 2.8 LIGHTING FIXTURE SUPPORT COMPONENTS

A. Comply with Section 260529 "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.

B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.

C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.

D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.

E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.

F. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.

G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.

B. Comply with NFPA 70 for minimum fixture supports.

C. Suspended Lighting Fixture Support:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.

D. Adjust aimable lighting fixtures to provide required light intensities.

E. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

### 3.2 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

B. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION 265100

SECTION 265600 - EXTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior luminaires with lamps and ballasts.
2. Luminaire-mounted photoelectric relays.

1.2 ACTION SUBMITTALS

A. Product Data: For each luminaire, pole, and support component, arranged in order of lighting unit designation. Include data on features, accessories, and finishes.

B. Shop Drawings: Anchor-bolt templates keyed to specific poles and certified by manufacturer.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with IEEE C2, "National Electrical Safety Code."

C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR LUMINAIRES

A. Luminaires shall comply with UL 1598 and be listed and labeled for installation in wet locations by an NRTL acceptable to authorities having jurisdiction.

B. Lateral Light Distribution Patterns: Comply with IESNA RP-8 for parameters of lateral light distribution patterns indicated for luminaires.

C. Metal Parts: Free of burrs and sharp corners and edges.

D. Sheet Metal Components: Corrosion-resistant aluminum unless otherwise indicated. Form and support to prevent warping and sagging.

E. Housings: Rigidly formed, weather- and light-tight enclosures that will not warp, sag, or deform in use. Provide filter/breather for enclosed luminaires.

F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to

prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position. Doors shall be removable for cleaning or replacing lenses. Designed to disconnect ballast when door opens.

G. Exposed Hardware Material: Stainless steel.

H. Plastic Parts: High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.

I. Light Shields: Metal baffles, factory installed and field adjustable, arranged to block light distribution to indicated portion of normally illuminated area or field.

J. Lenses and Refractors Gaskets: Use heat and aging-resistant resilient gaskets to seal and cushion lenses and refractors in luminaire doors.

K. Luminaire Finish: Manufacturer's standard paint applied to factory-assembled and -tested luminaire before shipping. Where indicated, match finish process and color of pole or support materials.

L. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

1. Label shall include the following lamp and ballast characteristics:

a. "USES ONLY" and include specific lamp type.
b. Lamp tube configuration (twin, quad, triple), base type, and nominal wattage for compact fluorescent luminaires.
c. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.
d. Start type (preheat, rapid start, instant start) compact fluorescent luminaires.
e. ANSI ballast type (M98, M57, etc.) for HID luminaires.
f. CCT and CRI for all luminaires.

## 2.2 LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS

A. Comply with UL 773 or UL 773A.

B. Contact Relays: Factory mounted, single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc and off at 4.5 to 10 fc with 15-second minimum time delay.

1. Relay with locking-type receptacle shall comply with ANSI C136.10.
2. Adjustable window slide for adjusting on-off set points.

## 2.3 FLUORESCENT BALLASTS AND LAMPS

A. Ballast Characteristics:

1. Power Factor: 90 percent, minimum.
2. Sound Rating: Class A.
3. Total Harmonic Distortion Rating: Less than 20 percent.

4. Electromagnetic Ballasts: Comply with ANSI C82.1, energy-saving, high power factor, Class P, automatic-reset thermal protection.
5. Case Temperature for Compact Lamp Ballasts: 65 deg C, maximum.
6. Transient-Voltage Protection: Comply with IEEE C62.41.1 and IEEE C62.41.2, Category A or better.

## 2.4 LED LUMINAIRES

A. Material and specifications for each luminaire are as follows:

1. Each luminaire shall consist of an assembly that utilizes LEDs as the light source. In addition, a complete luminaire shall consist of a housing, LED array, and electronic driver (power supply).
2. Each luminaire shall be rated for a minimum operational life of 50,000 hours at an average operating time of 11.5 hours per night. This life rating must be conducted40C ambient temperature.
3. The rated operating temperature range shall be -30°C to +40°C.
4. Photometry must be compliant with IESNA LM-79.
5. The individual LEDs shall be constructed such that a catastrophic loss or the failure of one LED will not result in the loss of the entire luminaire.
6. Luminaire shall be constructed such that LED modules may be replaced or repaired without replacement of whole luminaire.
7. Each luminaire shall be listed with Underwriters Laboratory, Inc. under UL1598 for luminaires, or an equivalent standard from a nationally recognized testing laboratory.
8. Surge Suppression: The luminaire on-board circuitry shall include fused surge protection devices (SPD) to withstand high repetition noise transients as a result of utility line switching, nearby lightning strikes, and other interference. The SPD shall protect the luminaire from damage and failure for common mode transient peak voltages up to 10 kV (minimum) and transient peak currents up to 5 kA (minimum). SPD shall conform to UL 1449 depending of the components used in the design. SPD performance shall be tested per the procedures in ANSI/IEEE C62.41-1992 (or current edition) for category C (standard). The SPD shall fail in such a way as the Luminaire will no longer operate. The SPD shall be field replaceable.
9. RF Interference: LED Drivers must meet Class A emission limits referred in Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 regulations concerning the emission of electronic noise.
10. Illuminance: The illuminance shall not decrease by more than 30% over the expected operating life. The measurements shall be calibrated to standard photopic calibrations.
11. The color rendition index (CRI) shall be 70 or greater.
12. Backlight-Uplight-Glare: The luminaire shall not allow more than 10 percent of the rated lumens to project above 80 degrees from vertical. The luminaire shall not allow more than 2.5 percent of the rated lumens to project above 90 degrees from vertical. Backlight and Glare ratings as per fixture schedule and calculated per IESNA TM-15.

B. Thermal Management

1. The thermal management (of the heat generated by the LEDs) shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life.
2. The LED manufacturer’s maximum thermal pad temperature for the expected life shall not be exceeded.
3. Thermal management shall be passive by design. The use of fans or other mechanical devices shall not be allowed.
4. The luminaire shall have a minimum heat sink surface such that LED manufacturer’s maximum junction temperature is not exceeded at maximum rated ambient temperature.
5. The heat sink material shall be aluminum.

C. Handhole: Oval-shaped, with minimum clear opening of 2-1/2 by 5 inches, with cover secured by stainless-steel captive screws.

D. Concrete Pole Foundations: Cast in place, with anchor bolts to match pole-base flange.

E. Power-Installed Screw Foundations: Factory fabricated by pole manufacturer, with structural steel complying with ASTM A 36/A 36M and hot-dip galvanized according to ASTM A 123/A 123M; and with top-plate and mounting bolts to match pole base flange and strength required to support pole, luminaire, and accessories.

F. Breakaway Supports: Frangible breakaway supports, tested by an independent testing agency acceptable to authorities having jurisdiction, according to AASHTO LTS-4-M.

G.

## PART 3 - EXECUTION

### 3.1 LUMINAIRE INSTALLATION

A. Install lamps in each luminaire.

B. Fasten luminaire to indicated structural supports.

C. Adjust luminaires that require field adjustment or aiming.

### 3.2 BOLLARD LUMINAIRE INSTALLATION

A. Align units for optimum directional alignment of light distribution.

### 3.3 CORROSION PREVENTION

A. Aluminum: Do not use in contact with earth or concrete. When in direct contact with a dissimilar metal, protect aluminum by insulating fittings or treatment.

### 3.4 FUSE PROTECTION

A. Provide one weatherproof fuse per phase.
   1. Install fuse(s) in the cast-in hand hole.
   2. Fuses not permitted in the fixture head.
   3. Fuse holder shall incorporate a rubber boot assembly.

END OF SECTION 265600

# SECTION 270000 – COMMUNICATION PATHWAYS

## 27 05 33 - Conduits and Backboxes for Communications Systems

### *Interior Conduits*

1. Be installed in the most direct and accessible route possible.

2. Contain no more than two 90-degree sweep in any dimensional plane or exceed 100-feet in length between pulling points or interior pull boxes.

3. A pull box is not to be used in place of a conduit sweep.

4. Stub up to an accessible ceiling area within 6-inches of a J-hook or cable tray from a device box.

5. Be reamed at both ends and have a plastic bushing installed on each end to prevent damage during cable installation.

6. Have a pull string installed in all conduits with a minimum test rating of 200 lb.

7. Not be installed through areas in which flammable materials may be stored or over and adjacent to boilers, incinerators hot water lines or steam lines.

8. All conduits shall be bonded and grounded in accordance with the NEC (National Electrical Code) and ANSI/TIA-607, where applicable.

9. Interior conduits and/or sleeves shall be properly sized in accordance with ANSI/TIA-569.

10. Wall-mounted riser conduits and/or sleeves entering a Telecommunications Space (ER/TR) shall have a plastic spillway installed onto the end of the conduit to prevent kinking of the installed cable bundle.

### *Structures to Support Vertically Aligned Telecommunications Spaces (TS)*

1. Vertically aligned TS's shall utilize sleeves and slots.

2. TS's that are not vertically aligned shall be connected with conduits.

3. In a multistory building, vertical cable runway shall be installed behind the sleeves and slots to allow for proper cable management and to support the riser cable's weight as it passes through the ER/TR.

4. A 2-inch conduit shall be dedicated from the ER/TR to a sealed junction box or weather head on the roof of the building for the installation of an antenna cable. This conduit shall be grounded using a path other than the telecommunications ground provided in the ER/TR.

### *Work Area Outlet (WAO) Conduit and Backbox Size Requirements*

1. All WAO's shall have a minimum of one (1) 1 inch trade size Electrical Metallic Tubing (EMT) conduit installed from the device box to readily accessible ceiling space within 6-inches of an installed J-hook or cable tray. WAO's shall have a standard 4-inch square by 2-7/8-inch deep device box with a single gang mud ring installed flush mounted within the wall.

2. Wall-mounted courtesy telephone device boxes shall be mounted per ADA requirements.

3. Floor-mounted WAO's shall have a minimum of one (1) 1-1/4 inch trade size Electrical Metallic Tubing (EMT) conduit installed from the device box to readily accessible ceiling space of the same floor within 6-inches of an installed J-hook or cable tray. Floor boxes shall not be looped or daisy-chained together with one single conduit, regardless of the size of conduit.

4. The maximum allowable conduit fill requirements shall be adhered to when designing conduit installations for WAO device box and Wiremold®, locations.

5. Typical mounting height shall be +18-inches AFF or match the height of new and existing power receptacles, where appropriate.

6. WAO's located in hose or wash-down areas shall be installed at a height above the anticipated damp area and shall include a UL Listed NEMA rated water resistant faceplate, outlet covers and patch cords.

### *Wireless Access Points (WAP)*

1. Where a WAP is located in a non accessible ceiling there shall be a minimum of one (1) 1 inch trade size Electrical Metallic Tubing (EMT) conduit installed from the device box to readily accessible ceiling space within 6-inches of an installed J-hook or cable tray. WAP's shall have a standard 4-inch square by 2-7/8-inch deep device box with a single gang mud ring installed flush mounted within the ceiling.

### *Communication Floor Poke-through Devices*

1. All floor poke-through devices shall be

    a. Indicated on the electrical and/or telecommunications drawings with the size of conduit to be installed. Cables shall terminate on the same floor they are installed on.

    b. Suitable for use in air handling spaces in accordance with Sec 300-22(C) of the National Electrical Code.

2. For the purpose of estimating provide Wiremold Legrand® Evolution Series Poke-Thru Devices, confirm product features with the City IT Representative starting at the DD phase of the project. Unit shall be fully recessed with die-cast aluminum spring-loaded slide doors; meet or exceed UL scrub water exclusion requirements; and meet ADA Standard 4.5 for floor surface level changes.

***Pull Box Installation Requirements***

1. Pull boxes shall be installed in easily accessible locations.

2. Pull boxes shall be placed above a suitably marked removable ceiling panel.

3. Pull boxes shall not be located in restricted and/or highly secured areas.

4. Pull boxes are not to be used in place of sweeps and 90's to round corners.

## End Section 27 05 33

## 27 05 36 - Cable Trays for Communications Systems

**Communications Cable Runway shall be:**

1. Used only in Telecommunications Rooms (TR).

2. Secured on 5-foot centers overhead using a standard trapeze type support system with 1/2-inch threaded rod in accordance with manufacturer specifications and applicable Building and Electrical Codes.

3. UL Classified, minimum 12-inches wide with 9-inch rung spacing.

4. Installed with a minimum clearance of 12-inches above the cable ladder.

6. Meet the current requirements in ANSI/TIA-569 and applicable addendums.

7. Grounded and bonded in accordance with ANSI/TIA-607. All splices, T-Sections and bends shall be bonded together. Cable runway and trays shall not be used as an equipment ground.

**Cable Trays**

1. Shall be steel wire basket or mesh suitable for hallways and false ceiling areas.

2. That are used to support horizontal cabling may be used to support riser cables provided the cable tray's carrying capacity can accommodate the riser cables.

3. Shall be a minimum of 12-inches wide and 2-inches deep and contain a metal divider with 4-inches sectioned off for security low voltage. The use of carbon steel, electro zinc plated wire basket tray system is the preferred cable tray system within the corridors. Refer to manufacture fill charts for correct sizing.

4. Shall be sized to accommodate future installations and building growth. Initial cable fill not to exceed 25% of tray capacity.

5. Shall be installed in accessible ceiling areas only and shall transition to a minimum of four 4-inch EMT conduits (one for security low voltage) when routed over fixed, hard and inaccessible

ceiling spaces.

6. Cable tray shall transition to a fire rated assembly to penetrate walls. Where conduits drop down onto cable tray provide plastic spillways installed onto the end of the conduit to prevent kinking of the installed cable bundle.

7. Shall be grounded and bonded in accordance with ANSI/TIA-607 and manufacturers requirements. All splices, T-Sections and bends shall be bonded together. Cable trays shall not be used as an equipment ground.

8. Penetrations through firewalls shall allow cable installers to firestop around the cables after they are installed. Tray-based mechanical firestop systems shall be used when a cable tray penetrates a fire barrier. All firestopping installations shall be labeled in accordance with ANSI/TIA-606.

9. Shall meet the requirements in ANSI/TIA-569 and applicable addendums.

**Cable Tray and Runway Clearances**

1. Cable trays shall not be placed within 5-inches of any overhead light fixture nor within 12-inches of any electrical ballast.

2. A minimum clearance of 12-inches above and 12 to 18-inches to one side of the cable tray shall be maintained at all times. All bends and T-joints in the cable trays shall be fully accessible from above (within one foot).

3. Cable trays shall be mounted no higher than 12-feet above the finished floor and shall not extend more than 4-feet over a fixed ceiling area.

## End Section 27 05 36

## 27 05 39 - Surface Raceways for Communications

System Raceway shall be:

1. Used only in areas where cabling cannot be placed within walls, ceilings or cable trays.

2. Secured using mechanical fasteners, double sided sticky tape is not acceptable.

3. Comply with the most restrictive requirements of Division 27 for wiring of the applicable class in the applicable location.

4. At a minimum, provide raceway with cross-sectional area equivalent to 1 inch diameter trade size for communication station cabling.

## End Section 27 05 39

## 27 05 43 - Underground Ducts and Raceways for Communications Systems

Coordinate with Division 26 and 33 for conduit routing.

### *Underground Conduit Construction General*

1. All designs must be coordinated with and approved City of Ft. Lauderdale representative.

2. Conduit shall be Polyvinyl-Chloride (PVC) Schedule 40 or 80 (dependent upon concrete encasement requirements), corrosion-resistant plastic with a 4-inch inside diameter for underground installations and Galvanized Rigid Steel (GRS) or PVC Externally Coated GRS for riser applications.

3. Spacers shall be used in the trench to support the conduits.

4. Fabric multi-cell type of inner duct shall be considered for conduits planned.

5. All installed conduits shall be cleaned and verified with a flexible mandrel and a stiff brush. Mandrels shall be 12-inches in length and sized to within 1/4-inch of the inside diameter of the conduit.

6. All conduits shall be provided with mule tape with a minimum of 200 pound pulling tension.

7. All unused entrance conduits shall be capped/plugged with expandable type duct plugs inside the building to prevent rodents, water or gases from entering the building.

8. Conduit stubs entering the building shall extend beyond the foundation and landscaping to prevent shearing of the conduit and allow for access. Conduit entering from a below grade point shall extend 4-inches above the finished floor in the ER/TR. Conduit entering from ceiling height shall terminate 4 inches below the finished ceiling.

9. All metallic conduit and sleeves shall be reamed, bushed and capped when placed.

10. The minimum depth of a trench shall allow for 24-inches of cover from the top of the conduit/cable to final grade. Warning tape containing metallic tracings shall be placed a minimum of 18-inches above the underground conduit/duct structure and direct-buried cable to minimize any chance of an accidental dig-up. Both ends of the metallic warning tape shall be accessible after installation.

11. There shall not be more than the equivalent of two (2) 90-degree bends (180-degrees total) between pull points, including offsets and kicks. Back-to-back 90-degree bends shall be avoided. All bends shall be manufactured long sweeping bends with a radius not less than 6 times the internal diameter of conduits 2-inches or smaller or 10 times the internal diameter of conduits larger than 2-inches. Bends made manually shall not reduce the internal diameter of the conduit.

### *Directional Boring*

1. High-density polyethylene (HDPE) conduit to be used for directional boring.

2. A swivel shall be used at all times to prevent rotation of the product pipe.

### *Sizing Underground Conduit*

The quantity and size of underground entrance conduits are based on the Size of the building:

1. (2) 2-inch conduits are standard for building to building
2. (2 or more) 4-inch conduits shall be used for each utility company entrance.

### *Conduit Separation Requirements*

1. The minimum recommended separation between telecommunications conduit systems and outside surfaces of foreign structures as required by the National Electrical Code (NESC) for personnel safety and the protection of telecommunications equipment shall be maintained at all times.

### *Maintenance Holes (MH) and Pull Boxes (PB) General Requirements*

1. MH/PB's are required where maximum cable reel lengths are exceeded, at the intersection of main and branch conduit runs and at other locations where access to the cable in a conduit system is required.

2. The maximum distance allowed between buildings and MH/PB's or between two MH/PBs' is 600 feet.

3. No more than (2) 90 degree bends in conduit between MH/PBs'.

4. MH's and PB's shall be constructed to withstand a minimum of ASSHTO-H20-44 full traffic loading.

5. All MH/PB covers shall be rated for heavy and constant vehicular traffic, regardless of placement location.

6. All hardware in MH/PB's shall be galvanized.

7. Pulling eyes shall be a minimum of 7/8-inches in diameter and located at opposite ends of each conduit entrance point.

8. All MH/PB covers shall be marked for easy identification (Communications).

9. MH locations where the distance between the ceiling of the manhole and the street level exceeds 24-inches shall require the installation of permanent steps in the neck of the MH. These steps shall be installed in the neck rings at the same time as the MH is being installed, per manufacturer instructions. Steps shall not be cut and cemented in place after the installation of the neck ring.

10. Provide (4) L-Cable Racks PB and (8) L-Cable Racks per MH.

11. Where placement location is a roadway, driveway, bike path, fire line, loading dock or trash pickup area, provide only a MH.

***Additional PB Requirements***

1. All Pull Boxes (PB) shall be equipped with slip resistant covers with height adjustment brackets, torsion assist openings, guard bars and hex head type bolts.

2. PB's shall not be placed in a main conduit route between two MH's. MH/PB's shall be placed at strategic locations in a conduit system to allow installers to pull cable through the conduit with minimum difficulty and to protect the cable from excessive tension.

3. Step rungs are to be installed within a pull box installed deeper than the standard 3-feet and extension rings are required to match grade. A minimum of a 4-feet by 6-feet by 3-feet box shall be installed.

***MH/PB Conduit Entry Requirements:***

1. If the total number of conduits being placed is significantly less than the capacity of the termination MH or cable entrance, conduit shall enter at the lower level. The upper space shall be reserved for future additions.

2. 22-degree and 45-degree conduit angles are preferred. Regardless of depth, all bends and sweeps shall be concrete encased to prevent movement and "burning through" by the pull rope during cable installations.

3. Conduits installed between MH/PB's and buildings and between other MH/PB's shall be sloped per ANSI/TIA-758 to ensure proper drainage of water.

6. All conduits entering buildings shall be plugged with expandable type duct plugs or equal, inside the building to prevent rodents, water or gases from entering the building. MH/PB conduits shall be plugged with duct seal material to prevent the entrance of water and gases.

**End Section 27 05 43**

## END OF SECTION 270000

# SECTION 31 13 00

# SELECTIVE TREE REMOVAL AND TRIMMING

## PART 1 GENERAL

### 1.0 RELATED DOCUMENTS

A. The PROCUREMENT AND CONTRACTING REQUIREMENTS, and applicable parts of DIVISION 01 - GENERAL REQUIREMENTS, as listed in the Table of Contents, shall be included in and made a part of this Section.

### 1.1 WORK INCLUDED

A. Provide all work necessary to perform selective clearing within the limits indicated on the Drawings and as specified herein. Selective clearing work shall include, but not be limited to, the following:

1. Tree pruning.
2. Cabling and guying of trees.
3. Flush cutting shrubs and trees and grinding of stumps and backfilling of holes with clean fill and topdress with 6 in. loam.
4. Removal of all rubbish, debris, and other materials to be disposed of as a result of the work of this section.

### 1.2 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 02 41 19, SELECTIVE DEMOLITION.
2. Section 32 96 00, TRANSPLANTING; Transplanting of existing trees.

## 1.3 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. American National Standards Institute (ANSI):

| | |
|---|---|
| A300 | Best management practices Tree Support Systems: Cabling, Bracing, and Guying |
| Z133.1 | Safety Requirements for Pruning, Trimming, Repairing, Maintaining and Removing Trees, and for Cutting Brush |
| Z133A | Best Management Practices Tree and Shrub Fertilization |

2. Tree Care Industry Association, 3537 Stratford Rd., Wantagh, NY 11793 (TCIA):

| | |
|---|---|
| Ref. 1 | Pruning Standards for Shade Trees |
| Ref. 2 | Standard for Fertilizing Shade and Ornamental Trees |
| Ref. 3 | Bracing, Cabling and Guying Standard for Shade Trees. |

## 1.4 SUBMITTALS

A. The Contractor shall submit to the Architect for review, proposed methods, and materials for selective clearing, including a schedule indicating specific dates for implementing specific work items in each major work area.

## 1.5 QUALITY ASSURANCE

A. Selective clearing methods shall conform to the applicable requirements of ANSI Z133.1

B. Selective pruning methods shall conform to the applicable requirements of ANSI Z133.1.

C. Work of this section shall be completed by a professional ISA Certified Arborist with a minimum five years' experience, who has successfully completed an exam and education program equal to the International Society of Arboriculture (ISA) Certification Program, sponsored by the International Society of Arboriculture 2009, P.O. Box 3129, Champaign, IL 61826 (217) 355-9411; Email: isa@isa-arbor.com.

D. Arborist shall have the following minimum qualifications:

1. Licensed Arborist in Jurisdiction where project is located.
2. Current member of ASCA or registered Consulting Arborist as designated by ASCA.
3. Licenses for application and use of pesticides.

# PART 2 PRODUCTS

## 2.1 CABLES AND GUYING MATERIALS:

A. Materials for guying and cabling trees shall conform to NAA Ref. 2.

# PART 3 EXECUTION

## 3.1 TREE PRUNING

A. Tree pruning shall be "Class II Medium Pruning" conforming to NAA Ref. 1.

B. Schedule of trees to be pruned and extent of pruning shall be as indicated on the Drawings. Tree pruning shall be as directed and approved by the Architect.

## 3.2 TREE REMOVAL

A. Trees indicated on the Drawings as "Remove" or trees tagged in the field by the Architect to be removed shall be felled. Stumps shall be routed out to a minimum depth of 12 in. below finished grade. Holes shall be backfilled with clean fill and top-dressed with 6 in. loam.

B. Tags of each felled tree shall be saved and returned to the Architect.

## 3.3 TREE CABLING AND GUYING

A. Cabling and guying methods shall conform to ANSI A300,Best Management Practices Tree Support Systems: Cabling, Bracing, and Guying.

1. Provide cabling and guying systems to accomplish structural support of the tree as scheduled on the Drawings.

## 3.4 DEADWOOD AND BRUSH REMOVAL

A. Deadwood and brush within the limits of work indicated on the Drawings shall be disposed of as follows:

1. Brush, limbs, and other material less than 6 in. in diameter shall be chipped and stockpiled on-site in an area designated by the Architect.
2. All deadwood shall be chipped and stockpiled as specified above.
3. Limbs 6 in. and larger shall, at the Contractor's option, be disposed of as follows:
   a. Material shall become the property of the Contractor and be disposed of off-site, or;
   b. Material shall be cut to 4 ft. lengths and stacked in an on-site location designated by the Architect.

B. All debris material not otherwise indicated shall be legally disposed of off-site.

**END OF SECTION**

# SECTION 31 13 00

# SELECTIVE TREE REMOVAL AND TRIMMING

## PART 1 GENERAL

### 1.0 RELATED DOCUMENTS

A. The PROCUREMENT AND CONTRACTING REQUIREMENTS, and applicable parts of DIVISION 01 - GENERAL REQUIREMENTS, as listed in the Table of Contents, shall be included in and made a part of this Section.

### 1.1 WORK INCLUDED

A. Provide all work necessary to perform selective clearing within the limits indicated on the Drawings and as specified herein. Selective clearing work shall include, but not be limited to, the following:

1. Tree pruning.
2. Cabling and guying of trees.
3. Flush cutting shrubs and trees and grinding of stumps and backfilling of holes with clean fill and topdress with 6 in. loam.
4. Removal of all rubbish, debris, and other materials to be disposed of as a result of the work of this section.

### 1.2 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 02 41 19, SELECTIVE DEMOLITION.
2. Section 32 96 00, TRANSPLANTING; Transplanting of existing trees.

## 1.3 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. American National Standards Institute (ANSI):

| | |
|---|---|
| A300 | Best management practices Tree Support Systems: Cabling, Bracing, and Guying |
| Z133.1 | Safety Requirements for Pruning, Trimming, Repairing, Maintaining and Removing Trees, and for Cutting Brush |
| Z133A | Best Management Practices Tree and Shrub Fertilization |

2. Tree Care Industry Association, 3537 Stratford Rd., Wantagh, NY 11793 (TCIA):

| | |
|---|---|
| Ref. 1 | Pruning Standards for Shade Trees |
| Ref. 2 | Standard for Fertilizing Shade and Ornamental Trees |
| Ref. 3 | Bracing, Cabling and Guying Standard for Shade Trees. |

## 1.4 SUBMITTALS

A. The Contractor shall submit to the Architect for review, proposed methods, and materials for selective clearing, including a schedule indicating specific dates for implementing specific work items in each major work area.

## 1.5 QUALITY ASSURANCE

A. Selective clearing methods shall conform to the applicable requirements of ANSI Z133.1

B. Selective pruning methods shall conform to the applicable requirements of ANSI Z133.1.

C. Work of this section shall be completed by a professional ISA Certified Arborist with a minimum five years' experience, who has successfully completed an exam and education program equal to the International Society of Arboriculture (ISA) Certification Program, sponsored by the International Society of Arboriculture 2009, P.O. Box 3129, Champaign, IL 61826 (217) 355-9411; Email: isa@isa-arbor.com.

D. Arborist shall have the following minimum qualifications:

1. Licensed Arborist in Jurisdiction where project is located.
2. Current member of ASCA or registered Consulting Arborist as designated by ASCA.
3. Licenses for application and use of pesticides.

# PART 2 PRODUCTS

## 2.1 CABLES AND GUYING MATERIALS:

A. Materials for guying and cabling trees shall conform to NAA Ref. 2.

# PART 3 EXECUTION

## 3.1 TREE PRUNING

A. Tree pruning shall be "Class II Medium Pruning" conforming to NAA Ref. 1.

B. Schedule of trees to be pruned and extent of pruning shall be as indicated on the Drawings. Tree pruning shall be as directed and approved by the Architect.

## 3.2 TREE REMOVAL

A. Trees indicated on the Drawings as "Remove" or trees tagged in the field by the Architect to be removed shall be felled. Stumps shall be routed out to a minimum depth of 12 in. below finished grade. Holes shall be backfilled with clean fill and top-dressed with 6 in. loam.

B. Tags of each felled tree shall be saved and returned to the Architect.

## 3.3 TREE CABLING AND GUYING

A. Cabling and guying methods shall conform to ANSI A300,Best Management Practices Tree Support Systems: Cabling, Bracing, and Guying.

1. Provide cabling and guying systems to accomplish structural support of the tree as scheduled on the Drawings.

## 3.4 DEADWOOD AND BRUSH REMOVAL

A. Deadwood and brush within the limits of work indicated on the Drawings shall be disposed of as follows:

1. Brush, limbs, and other material less than 6 in. in diameter shall be chipped and stockpiled on-site in an area designated by the Architect.
2. All deadwood shall be chipped and stockpiled as specified above.
3. Limbs 6 in. and larger shall, at the Contractor's option, be disposed of as follows:
   a. Material shall become the property of the Contractor and be disposed of off-site, or;
   b. Material shall be cut to 4 ft. lengths and stacked in an on-site location designated by the Architect.

B. All debris material not otherwise indicated shall be legally disposed of off-site.

**END OF SECTION**

# SECTION 32 13 13

# PORTLAND CEMENT CONCRETE PAVING

## PART 1 GENERAL

### 1.0 RELATED DOCUMENTS

A. The PROCUREMENT AND CONTRACTING REQUIREMENTS, and applicable parts of DIVISION 01 - GENERAL REQUIREMENTS, as listed in the Table of Contents, shall be included in, and made a part of this Section.

### 1.1 WORK INCLUDED

**A.** Provide all equipment and materials and do all work necessary to construct the colored and scored Portland cement concrete paving work, complete, as indicated on the Drawings.

### 1.2 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 03 30 01, CAST-IN-PLACE CONCRETE - SITEWORK; Concrete for site structures and below grade slabs and bases.
2. Section 31 20 00, EARTH MOVING; Excavation and backfill and establishment of subgrade elevations.
3. Section 32 13 14, EXPOSED AGGREGATE CONCRETE PAVING.
4. Section 32 14 13, CONCRETE UNIT PAVING.
5. Section 32 17 26, TACTILE WARNING SURFACING; ADA compliant detectable warning indicators.

## 1.3 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. American Concrete Institute (ACI):

| | |
|---|---|
| 301 | Specifications for Structural Concrete for Buildings |
| 305R | Hot Weather Concreting |
| 325.9R | Guide for Construction of Concrete Pavements and Concrete Bases. |

2. American Society for Testing and Materials (ASTM):

| | |
|---|---|
| A 185 | Welded Steel Wire Fabric for Concrete Reinforcement |
| A 615 | Deformed and Plain Billet - Steel Bars for Concrete Reinforcement |
| C 33 | Concrete Aggregates |
| C 94 | Ready-Mixed Concrete |
| C 143 | Slump of Portland Cement Concrete |
| C 150 | Portland Cement |
| C 171 | Sheet Materials for Curing Concrete |
| C 231 | Air Content of Freshly Mixed Concrete by the Pressure Method |
| C 260 | Air Entraining Admixtures for Concrete |
| C 309 | Liquid Membrane-Forming Compounds for Curing Concrete |
| C 494 | Chemical Admixtures for Concrete |
| D 226 | Asphalt-Saturated Organic Roofing Felt for Use in Membrane Waterproofing and Built-Up Roofing |

| | |
|---|---|
| D 1557 | Moisture - Density Relations of Soils and Soil Aggregate Mixtures Using 10 lb. (4.54-kg) Rammer and 18-in. (457 mm) Drop |

3. Americans with Disabilities Act (ADA):

| | |
|---|---|
| Appendix to Part 1191 | Accessibility Guidelines for Buildings and Facilities |

4. Corps of Engineers (COE):

| | |
|---|---|
| CRD-C 621 | Specification for Nonshrink Grout: Hardened State Volume Change |

5. Federal Specifications (Fed Spec.):

| | |
|---|---|
| TT-S-00227 | Sealing Compound: Elastomeric Type, Multi-Component (For Calking, Sealing, and Glazing in Buildings and other Structures) |

6. Florida Department of Transportation (FDOT):

| | |
|---|---|
| Specifications | Standard Specifications for Road and Bridge Construction |

## 1.4 SUBMITTALS

A. Description of Methods and Sequence of Placement.

B. Submit manufacturer's product data for the following:

1. Form release agent.
2. Slip resistive aggregate.

C. Submit samples of the following:

1. Preformed joint filler.
2. Color chart for selection of joint sealant color.

D. Verification Samples: Submit representative samples of the following materials for approval prior to construction of sample panels. Show full color ranges and finish variations expected. Provide samples having minimum size of 2 ft. X 3 ft.

E. Design Mixtures: For each concrete pavement mixture. Include alternate mixture designs when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

F. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Admixtures.
4. Curing compounds.
5. Bonding agent or epoxy adhesive.

G. Minutes of preinstallation conference.

## 1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: All products covered under this Section shall be produced by a single manufacturer, unless otherwise specified, with a minimum of ten (10) years proven production and installation of specialty exposed aggregate concrete.

1. Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.

2. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

A. ACI Publications: Unless otherwise specified, work and materials for construction of the Portland cement concrete paving shall conform to ACI 325.9R.

B. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1.

1. Before submitting design mixtures, review concrete pavement mixture design and examine procedures for ensuring quality of concrete materials and concrete pavement construction practices. Require representatives, including the following, of each entity directly concerned with concrete pavement, to attend conference:

a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete producer.

D. Work, materials, and color of paving shall conform to applicable sections of Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities.

E. Paving work, base course etc., shall be done only after excavation and construction work which might injure them have been completed. Damage caused during construction shall be repaired before acceptance.

F. Existing paving areas shall, if damaged or removed during course of this project, be repaired or replaced under this section of the specification. Workmanship and materials for such repair and replacement, except as otherwise noted, shall match as closely as possible those employed in existing work.

G. Pavement, base, or subbase shall not be placed on a muddy or frozen subgrade.

## 1.6 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

## 1.7 PRECONSTRUCTION MOCK-UP PANELS

A. General
1. Schedule mock-up casting for acceptance 30 days prior to casting of concrete surfaces represented by the mockups.
2. Locate mock-up panels in non-public areas accepted by the Architect.
3. Continue to cast mock-ups until acceptable mock-ups are produced. Accepted mock- ups shall be the standard for color, texture, joints, finish, and workmanship for the work.
4. Mock-up sequence of forming, placing, form removal, curing, jointing, and finishing shall be reviewed and accepted by the Architect.
5. Mock-up formwork shall be inspected and accepted by the Architect before placing of concrete.
6. Use the same concrete mixes and placement procedures, accepted in mock-ups, in the final work, unless otherwise directed by the Architect.
7. Protect accepted mock-ups from damage until project completion.
8. Accepted mock-ups shall remain on site throughout the duration of the Project. Remove mock-up panels from site at completion of project, as directed by the Architect.

B. Construct mock-up panels or areas as indicated to demonstrate the ability to cast concrete for concrete paving to achieve shape, color, jointing, and textured finish required. Mock-ups shall include or meet the following requirements:

1. Provide mock-up panel 5 ft. x 5 ft. size, full depth.
2. Provide mock-ups simulating actual design and execution conditions for concrete mix materials, reinforcement, formwork, placing sequence, form removal, curing, finishing, and methods and materials of stain removal and correction of defective work.
3. On mock-ups directed by the Architect, provide minimum of three variation of mix color to be used in the repair of defective work, to determine acceptable color and texture match.
4. Demonstrate in the construction of the mock-up formwork the sealer material, form release agent, and curing materials and methods to be used.
5. Include control joints and expansion joints as detailed.

C. Sample panel, 5 ft. x 5 ft. minimum, shall be constructed prior to start of handicap ramp paving, exhibiting detectable warning surface and required color contrast with adjacent paving in accordance with ADA Guidelines.

D. Source of Materials. Utilize the same source, stock, or brand of concrete materials for each class or mix of concrete which is to be exposed. Do not interchange materials or mixes until an additional mock-up shows that uniformity in finish texture and color, as compared to original mock-up will be maintained. If necessary, obtain and stockpile materials in sufficient quantity to ensure continuity and uniformity.

### 1.8 TESTING AND INSPECTION

A. Contractor shall provide a minimum of four (4) test results indicating compliance with minimum compressive strength requirements of fully cured concrete pavement.

B. The Owner reserves the right to inspect and test paving and associated work.

## PART 2 PRODUCTS

### 2.1 AGGREGATE BASE

A. Material for aggregate base course: FDOT Specifications Section 911-2.23, “Limerock Composition”. Refer to Section 31 20 00, EARTH MOVING.

### 2.2 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.

B. Use flexible or curved forms for curves of a radius 100 feet (30.5 m) or less.

C. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

## 2.3 STEEL REINFORCEMENT

A. Steel reinforcing bars shall conform to the following requirements:

1. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420); deformed.

B. Welded wire fabric reinforcement shall conform to the following applicable requirements. Fabric reinforcement shall be furnished in flat sheets. Fabric reinforcement in rolls will not be permitted.

1. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

C. Epoxy-Coated Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60 (Grade 420), plain steel bars.

D. Tie Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

## 2.4 PORTLAND CEMENT CONCRETE

A. Portland cement concrete for pavements shall be gray, air-entrained type with a maximum water-cement ratio of 0.50 conforming to ACI 325.9R. Minimum compressive strengths at 28 days shall be 4,000 psi.

1. Concrete shall be air-entrained type, conforming to ASTM C 94. Air content by volume shall be 6% + 1%, and shall be tested in accordance with ASTM C 231.
2. Concrete slump shall be no less than 2 in. nor greater than 4 in., determined in accordance with ASTM C 143.
3. Cement shall be gray Portland cement, conforming to ASTM C 150, Type I or II. Only one color of cement, all of the same manufacturer, shall be used for the work. Type III cement shall be used only with the prior approval of the Architect.
4. Fine and coarse aggregates shall conform to ASTM C 33.
5. Concrete shall contain a water reducing agent to minimize cement and water content of the concrete mix at the specified slump. Water reducing agent shall conform to ASTM C 494.
6. No calcium chloride or admixtures containing calcium chloride shall be added to the concrete. No admixtures other than those specified shall be used in the concrete without the specific written permission of the Architect in each case.

## 2.5 COLOR ADMIXTURE

A. Color admixture shall be suitable for concrete pavement and shall meet or exceed the requirements set by Portland Cement Association (PCA) and ASTM C 91, C 270 and C 494.

B. Color admixture shall not affect workability, setting, or strength of concrete adversely. Color pigments shall consist of chemically inert, non-fading, alkali-fast mineral oxides, finely ground and prepared for use in cement and mortar. Admixture shall not contain calcium chloride.

C. Color admixture shall be Chromix Color Admixture, manufactured by L.M. Scofield Company, 4155 Scofield Road, Douglasville, GA 30134; Tel. 800-800-9900, Dry Integral Color CP, manufactured by Solomon Colors, Inc., 360 S. Lilac Ave, Rialto, CA 92376, or approved equal.

1. Color shall match per drawings specifications.

D. Mix design shall conform to manufacturer's recommendations, and directions of the Architect to achieve proposed color. Strictly monitor additive/cement ratio throughout job to ensure uniform color.

## 2.6 CURING COMPOUND FOR COLOR CONDITIONED CONCRETE

A. Concrete colored with color admixture shall be cured with "LITHOCROME" Colorwax, manufactured by L.M. Scofield Company, 4155 Scofield Road, Douglasville, GA 30134; Tel. 800-800-990, in the matching color, depending on appearance, and degree of maintenance desired. Product of equal quality and performance shall be subject to approval.

## 2.7 CHEMICAL ADMIXTURES

A. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.

## 2.8 CURING MATERIALS

A. Curing shall be by moist curing or by use of curing compound.

B. Curing paper shall be a nonstaining, fiber reinforced laminated kraft bituminous product conforming to ASTM C 171. Four mil polyethylene sheeting may be substituted for curing paper.

C. Water: Potable.

D. Curing compound shall be a clear compound conforming to ASTM C 309, Type 1 or white pigmented compound conforming to ASTM C 309 Type 2, Class B.

## 2.9 EXPANSION JOINTS

A. Expansion joints shall be located as indicated on the Drawings.

B. Expansion joints shall be cold formed with thickened edges. Expansion joints shall be doweled where indicated on the Drawings.

C. Round Expansion Joint Dowels: ASTM A615, Grade 60, epoxy-coated, smooth, billet-steel bars, clean and free of rust and scale.

## 2.10 CONTROL JOINTS

A. Control joints indicated on the Drawings to be sawn, shall be made by saw cutting concrete slab after concrete is finished and when the surface is stiff enough to support the weight of workmen without damage to the slab. Saw blade shall cut into slab at least 2 in., but in no case less than 1/3 of slab depth.

B. Control joint design has been included on the Jointing Plans, however, if special joint layout is not indicated on the Jointing Plans, control joints shall be located 10 ft. on center maximum.

## 2.11 CONSTRUCTION JOINTS

A. Transverse construction joints shall be placed whenever placing of concrete is suspended for more than 30 minutes.

1. Butt joint with dowels or thickened edge joint shall be used if construction joints occur at location of control joint.
2. Keyed joints with tie bars shall be used if the joint occurs at any other location.

## 2.12 GROUT

A. Grout shall be mixed in the proportions of one part Portland cement to two parts sand, by volume. Only sufficient water shall be used to enable grout to barely hold its shape when squeezed into a ball in the hand. Sand for grout shall be "Fine Aggregate", conforming to ASTM C 33.

B. Nonshrink grout shall be pre-mixed non-shrinking, high strength grout. Compressive strength in 28 days shall be 5,000 psi minimum, but in no case less than the specified strength of the adjacent concrete. Manufacturer shall provide evidence that the material meets the requirements of the COE CRD-C 621 (558). Grout permanently exposed to view shall be nonoxidizing; metallic grout may be used in other locations.

1. Nonshrink grout shall be one of the following, or approved equal:

| Manufacturer: | Product: |
|---|---|
| Gifford-Hill Co. | Supreme |
| Master Builders Co. | Embeco |
| U.S. Grout Corporation | Five Star Grout |

## 2.13 BOND BREAKER

A. Bond breaker shall be asphalt felt conforming to ASTM D 226, Type I or 6 mil polyethylene sheeting.

## 2.14 SURFACE SEALANT

A. Surface sealant shall be Amteco Silox Seal, a silane/siloxane water-based high performance penetrative masonry water repellent, manufactured by MFG Sealants Company, 1458 Chatahoochee Ave., NW, Atlanta, GA 30318; T: 404-355-0668; 1-800-297- 7325, or approved equal.

1. Surface sealant shall be compatible with integral concrete color admixtures.

## PART 3 - EXECUTION

### 3.1 GRADING

A. Areas to be paved will be compacted and brought approximately to subgrade elevation under Section 31 20 00, EARTH MOVING before work of this section is performed. Final fine grading, filling, and compaction of subgrade to receive paving, as required to form a firm, uniform, accurate, and unyielding subgrade at required elevations and to required lines, shall be done under this Section.

B. Existing subgrade material which will not readily compact as required shall be removed and replaced with satisfactory materials. Additional materials needed to bring subgrade to required line and grade and to replace unsuitable material removed shall be material conforming to Section 31 20 00, EARTH MOVING.

C. Subgrade of areas to be paved shall be recompacted as required to bring top 8 in. of material immediately below gravel base course to a compaction of at least 90% of maximum density, as determined by ASTM D 1557, Method D. Subgrade compaction shall extend for a distance of at least 1 ft. beyond pavement edge.

D. Excavation required in pavement subgrade shall be completed before fine grading and final compaction of subgrade are performed. Where excavation must be performed in completed subgrade or subbase subsequent backfill and compaction shall be performed as directed by the Architect as specified in Section 312000, EARTH MOVING. Completed subgrade after filling such areas shall be uniformly and properly graded.

E. Areas being graded or compacted shall be kept shaped and drained during construction. Ruts greater than or equal to 2 in. deep in subgrade, shall be graded out, reshaped as required, and recompacted before placing pavement.

F. Materials shall not be stored or stockpiled on subgrade.

G. Disposal of debris and other material excavated and/or stripped under this section, and material unsuitable for or in excess of requirements for completing work of this Section shall conform to the following:

1. Material shall be legally disposed of off-site.

H. Prepared subgrade will be inspected by the Architect. Subgrade shall be approved by the Architect before installation of paving base course. Disturbance to subgrade caused by inspection procedures shall be repaired under this Section of the specification.

## 3.2 AGGREGATE BASE COURSE

A. Aggregate base course for paving and the spreading, grading, and compaction methods employed shall conform to standard requirements for usual base course of this type for first class road work, and the following:

1. Refer to Section 31 20 00, EARTH MOVING and FDOT Standard Specifications Section 230.

B. Portions of subgrade or of construction above which become contaminated, softened, or dislodged by passing of traffic, or otherwise damaged, shall be cleaned, replaced, and otherwise repaired to conform to the requirements of this specification before proceeding with next operation.

## 3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

## 3.4 REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Before being placed in position, reinforcing for reinforced concrete shall be thoroughly cleaned of loose mill and rust scale, dirt, ice, and other foreign material which may reduce the bond between the concrete and reinforcing. Where there is delay in placing concrete after reinforcement is in place, bars shall be reinspected and cleaned when necessary.

C. Any bar showing cracks after bending shall be discarded.

D. Unless otherwise indicated on the Drawings, reinforcing shall extend within 2 in. of formwork and expansion joints. Reinforcing shall continue through control joints. Adjacent sheets of fabric reinforcing shall lap 6 in.

E. After forms have been coated with form release agent, but before concrete is placed, reinforcing steel anchors shall be securely wired in the exact position called for, and shall be maintained in that position until concrete is placed and compacted. Chair bars and supports shall be provided in a number and arrangement satisfactory to the Architect.

F. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

## 3.5 CONCRETE PAVING

A. Paving mix, equipment, methods of mixing and placing, and precautions to be observed as to weather, condition of base etc., shall meet the requirements of ACI 325.9R. Pavement shall be constructed in accordance with the Drawings.

B. The Architect shall be notified of concrete placement sufficiently in advance of start of operation to allow his representative to complete preliminary inspection of the work, including subgrade, forms, and reinforcing steel, if used.

C. Normal concrete placement procedures shall be followed. Concrete shall arrive at the jobsite so that no additional water will be required to produce the desired slump. When conditions develop that required addition of water to produce the desired slump, permission of the Architect must be obtained. The concrete shall be transported from the mixer to its place of deposit by a method that will prevent segregation or loss of material.

D. Work shall not be performed during rainy weather or when temperature is less than $40^{o}$ F. ($4.4^{o}$ C).

E. Adjacent work, etc., shall be protected from stain and damage during entire operation. Damaged and stained areas shall be replaced or repaired to equal their original conditions.

F. Existing concrete, earth, and other water-permeable material against which new concrete is to be placed shall thoroughly damp when concrete is placed. There shall be no free water on surface.

G. Concrete which has set or partially set before placing shall not be employed. Retempering of concrete will not be permitted.

H. Concrete shall be thoroughly spaded and tamped to secure a solid and homogeneous mass, thoroughly worked around reinforcement and into corners of forms.

I. When joining fresh concrete to concrete which has attained full set, latter shall be cleaned of foreign matter, and mortar scum and laitance shall be removed by chipping and washing. Clean, roughened base surface shall be saturated with water, but shall have no free water on surface. A coat of 1:1 cement-sand grout, approximately 1/8 in. thick, shall be well scrubbed into thoroughly dampened concrete base. New concrete shall be placed immediately, before grout has dried or set.

## 3.6 FINISH

A. Concrete flatwork surfaces shall be screeded off, bullfloated, power or hand floated, troweled and finished true to line and grade, and free of hollows and bumps. Surface shall be dense, smooth, and at exact level and slope required.

1. Finished concrete surface for concrete walks and pads and concrete band shall be wood-floated and steel troweled to a smooth surface. Surface shall not deviate more than 1/8 in. in 10 ft.

B. Light Sand Blast Finish: Provide light sand blast finish, lightly exposing fine aggregate with no reveal, as on Architect's sample panel, approved sample, and mockup installation. Finish shall be free of surface defects such as migrated entrained air or entrapped air bubbles over 1/8 in. diameter, sand streaks, staining, lack of uniformity of color or finish, blotches, wash, form leakage or honeycomb, and physical damage, any of which shall be deemed cause for rejection.

B. Scoring: Score decorative jointing in concrete surfaces 1/3 depth of slab with diamond blade saw.

## 3.7 CURING

A. It is essential that concrete be kept continuously damp from time of placement until end of specified curing period. It is equally essential that water not be added to surface during floating and troweling operations, and not earlier than 24 hours after concrete placement. Between finishing operations surface shall be protected from rapid drying by a covering of waterproofing paper. Surface shall be damp when the covering is placed over it, and shall be kept damp by means of a fog spray of water, applied as often as necessary to prevent drying, but not sooner than 24 hours after placing concrete. None of the water so applied shall be troweled or floated into surface.

B. Concrete surfaces shall be cured by completely covering with curing paper or application of a curing compound.

1. Concrete cured using waterproof paper shall be completely covered with paper with seams lapped and sealed with tape. Concrete surface shall not be allowed to become moistened between 24 and 36 hours after placing concrete. During curing period surface shall be checked frequently and sprayed with water as often as necessary to prevent drying, but not earlier than 24 hours after placing concrete.

2. If concrete is cured with a curing compound, compound shall be applied at a rate of 200 sq. ft. per gallon, in two applications perpendicular to each other.

3. Curing period shall be seven days minimum.

## 3.8 CURING COLORED CONCRETE

A. General:

1. Colored concrete shall not under any circumstances, be cured using water fog misting or ponding, burlap, plastic sheeting, or other wet covering.
2. Curing material and method shall be in strict conformance with manufacturer's guidelines and recommendations.
3. Only if additional protection is absolutely required, the surface should remain uncovered for at least 4 days, after which time new and unwrinkled non-staining reinforced waterproof kraft curing paper may be used.

B. Apply Color Wax curing compound for colored concrete according to manufacturer's instructions using manufacturer’s recommended application techniques. Apply curing compound at consistent time for each pour to maintain close color consistency.

1. Curing compound shall be same color as the colored concrete and supplied by same manufacturer of the colored admixture.
2. Precautions shall be taken in hot weather to prevent plastic cracking resulting from excessively rapid drying at surface as described in CIP 5 *Plastic Shrinkage Cracking* published by the National Ready Mixed Concrete Association.
3. Do not cover concrete with plastic sheeting.

## 3.9 HANDICAP RAMPS

A. Paving mix, equipment, methods of mixing and placing, and precautions to be observed as to weather, condition of base etc., shall meet the requirements of ACI 316 for any concrete paving in similar conditions. Handicap ramps shall be constructed in accordance with the Drawings, and ADA Guidelines 4.7.10, and 4.29.2.

B. The Architect shall be notified of imprinted concrete placement sufficiently in advance of start of operation to allow his representative to complete preliminary inspection of the work, including subgrade, forms, and reinforcing steel, if used.

C. Normal concrete placement procedures shall be followed. Concrete shall arrive at the jobsite so that no additional water will be required to produce the desired slump. When conditions develop that required addition of water to produce the desired slump, permission of the Architect must be obtained. The concrete shall be transported from the mixer to its place of deposit by a method that will prevent segregation or loss of material.

D. Stamping procedures, application of color hardener and color curing compound, and finishing procedures shall be in accordance with manufacturer's recommendations and ADA Guidelines for Diagonal Curb Ramps, and Detectable Warnings on Walking Surfaces.

## 3.10 CONSTRUCTION JOINTS

A. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
2. Provide tie bars at sides of pavement strips where indicated.
3. Butt Joints: Use epoxy bonding adhesive at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

## 3.11 EXPANSION JOINTS

A. Expansion joints (isolation joints) shall be cold formed with thickened edges as indicated on the Drawings.

B. Where indicated, expansion joints shall be doweled. Dowel shall be centered over the joint prior to concrete placement. The end of the dowel at the side of joint which will be poured second shall be greased immediately before concrete placement.

## 3.12 CONTROL JOINTS

A. Joints shall be sawn as soon as the concrete will withstand the energy of sawing without raveling or dislodging aggregate particles. For most concrete mixtures, this means sawing should be completed within the first 6 to 18 hours and never delay more than 24 hours. Early-entry saws may be used to allow cutting to begin within a few hours after placement.

B. Control joints indicated shall be sawn 1/8 in. wide by using a diamond blade concrete power saw. Saw shall cut into slab at least 1/3 of slab depth. Saw cut joints shall be straight and accurate to line.

1. Saw cut joints shall be sawn flush to vertical surfaces.

## 3.13 DECORATIVE SAW CUT JOINTS

A. Unless otherwise indicated, decorative saw cut joints shall be sawn into the concrete slab at intervals and patterns indicated on the Drawings. Joint shall be made after concrete is finished and when the surface is stiff enough to support the weight of workmen without damage to the slab, but before slab has achieved its final set. Saw cut joints shall be straight and accurate to line.

1. Saw cut joints shall be sawn flush to vertical surfaces.

B. Decorative saw cut joints shall be located each way to create scoring patterns indicated on the Drawings.

C. Depth of decorative saw cut joint shall be 1/3 of slab depth.

## 3.14 HANDICAP RAMPS

A. Paving mix, equipment, methods of mixing and placing, and precautions to be observed as to weather, condition of base etc., shall meet the requirements of ACI 316 for any concrete paving in similar conditions. Handicap ramps shall be constructed in accordance with the Drawings, and ADA Guidelines 4.7.10, and 4.29.2.

## 3.15 HOT WEATHER CONCRETING

A. Concrete just placed shall be protected from the direct rays of the sun and the forms and reinforcement just prior to placing shall be sprinkled with cold water. Every effort shall be made to minimize delays which will result in excessive mixing of the concrete after arrival on the job.

B. During periods of excessively hot weather (95$^{O}$F., or above), ingredients in the concrete shall be cooled insofar as possible and cold mixing water shall be used to maintain the temperature of the concrete at permissible levels all in accordance with the provisions of ACI 305. Any concrete with a temperature above 95$^{O}$F., when ready for placement will not be acceptable, and will be rejected.

C. Temperature records shall be maintained throughout the period of hot weather giving air temperature, general weather conditions (calm, windy, clear, cloudy, etc.) and relative humidity. Records shall include checks on temperature of concrete as delivered and after placing in forms. Data should be correlated with the progress of the work so that conditions surrounding the construction of any part of the structure can be ascertained.

## 3.16 PAVEMENT TOLERANCES

A. Comply with tolerances of ACI 117 and as follows:

1. Elevation: 1/4 inch (6 mm).
2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
3. Surface: Gap below 10-foot- (3-m-) long, unleveled straightedge not to exceed 1/4 inch (6 mm).
4. Lateral Alignment and Spacing of Dowels: 1 inch (25 mm).
5. Vertical Alignment of Dowels: 1/4 inch (6 mm).
6. Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 1/4 inch per 12 inches (6 mm per 300 mm).
7. Joint Spacing: 3 inches (75 mm).
8. Sawn Joint Depth: Plus 1/4 inch (6 mm), no minus.
9. Joint Width: Plus 1/8 inch (3 mm), no minus.

## 3.17 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least 1 composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.
   a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.
   a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mix will be satisfactory if average of any 3-consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

## 3.18 PROTECTION OF CONCRETE SURFACES

A. Concrete surfaces shall be protected from traffic or damage until surfaces have hardened sufficiently. If necessary 1/2 in. thick plywood sheets shall be used to protect the exposed surface.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

## 3.19 CONSTRUCTION WASTE MANAGEMENT

A. Comply with the requirements of Section 017419, CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL for removal and disposal of construction debris and waste.

1. Do not allow excavated materials to accumulate on-site.

**END OF SECTION**

# SECTION 32 13 14

# EXPOSED AGGREGATE CONCRETE PAVING

## PART 1 GENERAL

### 1.0 RELATED DOCUMENTS

A. The PROCUREMENT AND CONTRACTING REQUIREMENTS, and applicable parts of DIVISION 01 - GENERAL REQUIREMENTS, as listed in the Table of Contents, shall be included in, and made a part of this Section.

### 1.1 WORK INCLUDED

**A.** The work includes furnishing all labor, materials, equipment, and supervision to construct the exposed aggregate concrete paving work, including aggregate base course as indicated on the Drawings.

### 1.2 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 01 23 00, ALTERNATES; Description of alternates.
2. Section 03 30 01, CAST IN PLACE CONCRETE - SITEWORK.
3. Section 31 20 00, EARTH MOVING; Establishment of subgrade elevation.
4. Section 32 13 13, PORTLAND CEMENT CONCRETE PAVING.
5. Section 32 17 26, TACTILE WARNING SURFACING; ADA compliant detectable warning plates.

### 1.3 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirement shall govern.

1. American Concrete Institute (ACI):

| | |
|---|---|
| 305R | Hot Weather Concreting |
| 306R | Cold Weather Concreting |
| 325.9R | Guide for Construction of Concrete Pavements and Concrete Bases. |

2. American Society for Testing and Materials (ASTM):

| | |
|---|---|
| A 185 | Welded Steel Wire Fabric for Concrete Reinforcement |
| A 615 | Deformed and Plain Billet - Steel Bars for Concrete Reinforcement |
| C 33 | Concrete Aggregates |
| C 94 | Ready-Mixed Concrete |
| C 143 | Slump of Portland Cement Concrete |
| C 150 | Portland Cement |
| C 171 | Sheet Materials for Curing Concrete |
| C 231 | Air Content of Freshly Mixed Concrete by the Pressure Method |
| C 309 | Liquid Membrane-Forming Compounds for Curing Concrete |
| C 494 | Chemical Admixtures for Concrete |
| D 226 | Asphalt-Saturated Organic Roofing Felt for Use in Membrane Waterproofing and Built-Up Roofing |
| D 1557 | Moisture - Density Relations of Soils and Soil Aggregate Mixtures Using 10 lb. (4.54-kg) Rammer and 18-in. (457 mm) Drop |

3. Americans with Disabilities Act (ADA):

| | |
|---|---|
| Appendix to Part 1191 | Accessibility Guidelines for Buildings and Facilities |

4. Florida Department of Transportation (FDOT):

| | |
|---|---|
| Specifications | Standard Specifications for Road and Bridge Construction |

## 1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: All products covered under this Section shall be produced by a single manufacturer, unless otherwise specified, with a minimum of ten (10) years proven production and installation of specialty exposed aggregate concrete.

1. Manufacturer of ready-mixed concrete products who complies with ASTM C 94/C 94M requirements for production facilities and equipment.

2. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

B. ACI Publications: Unless otherwise specified, work and materials for construction of the Portland cement concrete paving shall conform to ACI 325.9R.

C. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

D. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1.

1. Before submitting design mixtures, review concrete pavement mixture design and examine procedures for ensuring quality of concrete materials and concrete pavement construction practices. Require representatives, including the following, of each entity directly concerned with concrete pavement, to attend conference:
   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mix concrete producer.

E. Work, materials, and color of the handicap ramp paving shall conform to applicable sections of Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities.

F. Paving work, base course etc., shall be done only after excavation and construction work which might injure them have been completed. Damage caused during construction shall be repaired before acceptance.

G. Existing paving areas shall, if damaged or removed during course of this project, be repaired, or replaced under this section of the specification. Workmanship and materials for such repair and replacement, except as otherwise noted, shall match as closely as possible those employed in existing work.

H. Pavement, base, or subbase shall not be placed on a muddy or frozen subgrade.

## 1.5 PROJECT CONDITIONS

A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

## 1.6 PRECONSTRUCTION MOCK-UP PANELS

A. General

1. Schedule mock-up casting for acceptance 30 days prior to casting of concrete surfaces represented by the mockups.
2. Locate mock-up panels in non-public areas accepted by the Architect.
3. Continue to cast mock-ups until acceptable mock-ups are produced. Accepted mock- ups shall be the standard for color, texture, joints, finish and workmanship for the work.
4. Mock-up sequence of forming, placing, form removal, curing, jointing and finishing shall be reviewed and accepted by the Architect.
5. Mock-up formwork shall be inspected and accepted by the Architect before placing of concrete.
6. Use the same concrete mixes and placement procedures, accepted in mock-ups, in the final work, unless otherwise directed by the Architect.
7. Protect accepted mock-ups from damage until project completion.
8. Accepted mock-ups shall remain on site throughout the duration of the Project. Remove mock-up panels from site at completion of project, as directed by the Architect.

B. Construct mock-up panels or areas as indicated to demonstrate the ability to cast concrete for each exposed aggregate concrete paving type to achieve shape, color, jointing and exposed aggregate textured finish required. Tamping or vibrating shall be minimized to allow coarse aggregate to remain near the surface. Mock-ups shall include or meet the following requirements:

1. Provide mock-up panel 5 ft. x 5 ft. size, full depth.
2. Provide mock-ups simulating actual design and execution conditions for concrete mix materials, reinforcement, formwork, placing sequence, form removal, curing, finishing, and methods and materials of stain removal and correction of defective work.
3. On mock-ups where directed by the Architect, provide minimum of three variation of mix color to be used in the repair of defective work, in order to determine acceptable color and texture match.
4. Demonstrate in the construction of the mock-up formwork the sealer material, form release agent, and curing materials and methods to be used.
5. Include control joints and expansion joints with joint sealer.

C. Sample panel, 5 ft. x 5 ft. minimum, shall be constructed prior to start of handicap ramp paving, exhibiting detectable warning surface and required color contrast with adjacent paving in accordance with ADA Guidelines.

D. Source of Materials. Utilize the same source, stock, or brand of concrete materials for each class or mix of concrete which is to be exposed. Do not interchange materials or mixes until an additional mock-up shows that uniformity in finish texture and color, as compared to original mock-up will be maintained. If necessary, obtain and stockpile materials in sufficient quantity to ensure continuity and uniformity.

## 1.6 SUBMITTALS

A. Description of Methods and Sequence of Placement. For each type of specially finished concrete provide description of methods and sequence of placement.

B. Manufacturers' product data shall be submitted for the following items:

Admixtures
Aggregate, including sieve analysis.
Specialty Aggregates
Concrete sealer
Curing material
Form release agent
Surface retarder

C. Submit samples of the following:

1. A 10 lb. minimum sample of blue glass aggregate proposed for use in the exposed aggregate paving mix shall be submitted for approval. Accompanying the sample shall be information from the aggregate supplier indicating source, type, color, and gradation of aggregate.
2. A 10 lb. minimum sample of shell aggregate proposed for use in the exposed aggregate paving mix shall be submitted for approval. Accompanying the sample shall be information from the aggregate supplier indicating source, type, color, and gradation of aggregate.

D. Material Certificates: Signed by manufacturers certifying that each of the following materials complies with requirements:

1. Cementitious materials.
2. Steel reinforcement and reinforcement accessories.
3. Admixtures.
4. Curing compounds.
5. Applied finish materials.
6. Bonding agent or epoxy adhesive.

E. Field quality-control test reports.

F. Minutes of preinstallation conference.

## 1.7 TESTING AND INSPECTION

A. The Owner reserves the right to inspect and test paving and associated work in accordance with Section 01 40 00, QUALITY REQUIREMENTS.

## 1.8 DESIGN OF CONCRETE MIX

A. The Contractor shall be responsible for the design of the concrete mixture. Mix design shall match mix design used in approved mock-up panel and be certified by an independent testing laboratory. The statement of materials constituting the design mix shall be submitted to the Architect for approval within one week following award of Contract. The concrete mix design shall include the following information:

1. Proportions of cement, fine and coarse aggregates, and water.
2. Water-cement ratio, design strength, slump, and air content.
3. Type of cement.
4. Type of aggregates including sieve analysis.
5. Type and dosage of all admixtures.
6. Special requirements for pumping.
7. Range of ambient temperature and humidity for which the design is valid.
8. Any special characteristics of the mix which require precautions in the mixing, placing, finishing, or curing methods to achieve the finished product specified.

B. No concrete shall be delivered to the job site until the Architect has reviewed and approved the design mix.

## PART 2 - PRODUCTS

### 2.1 AGGREGATE BASE

A. Material for aggregate base course: FDOT Specifications Section 911-2.23, “Limerock Composition”. Refer to Section 31 20 00, EARTH MOVING.

### 2.2 STEEL REINFORCEMENT

A. Steel reinforcing bars shall conform to the following requirements:

1. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420); deformed.

B. Welded wire fabric reinforcement shall conform to the following applicable requirements. Fabric reinforcement shall be furnished in flat sheets. Fabric reinforcement in rolls will not be permitted.

1. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

C. Epoxy-Coated Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60 (Grade 420), plain steel bars.

D. Tie Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

### 2.3 FORMS

A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, smooth exposed surfaces.

### 2.4 CONCRETE

A. Concrete mix to receive an exposed-aggregate surface shall contain Portland cement (as indicated for described mix), ASTM C 150, Type II Portland cement with a water- cement ratio no greater than 0.53 by weight. Minimum compressive strength shall be 4,000 psi at 28 days.

B. Aggregates: ASTM C33, clean, hard, durable, and uncoated.
1. Fine: Natural Sand free from silt, loam, and clay.
2. Course: Crushed, stone, maximum size No. 467

C. Maximum slump shall not exceed 4 in. and air entrainment shall be 6 percent $\pm$ 1 percent.

D. Ready mixed concrete, if used, shall meet ASTM C 94.

E. Surface Aggregate: Aggregate shall be size, and ratio indicated on the Drawings and approved by Architect per submittals and mock-ups.

## 2.5 CHEMICAL ADMIXTURES

A. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.

## 2.6 SPECIAL AGGREGATE

A. Special aggregate to be exposed shall be hard, sound, durable, and free of all deleterious materials and staining qualities.

B. Aggregate shall be glass, glow glass and/or crushed shell aggregate material and shall match that in the approved samples and mockup panels.

1. Glow Glass shall be a mixture of ¼" & ½" Photoluminescent aggregate Ultra-Grade Glow Stone whose color is indicated in the drawings. The aggregate is to have a glow persistence of 12+ hours with an initial charge time of 8-10 minutes. The product used is to have a design life no less than 20 years. The luminescence is to be 1215 to 2244 mcd at 1 minute. The aggregate is to be provided by the following manufacturer or approved equal:

   Ambient Glow Technology
   www.ambientglowtechnology.com
   1064 Salk Rd #12,
   Pickering, ON.,
   L1W 4B5
   Canada

   Aggregate colors, sizes, and application indicated on the Drawings.

2. If indicated in the drawings: Crushed shell shall be crushed coquina shell supplied by Yardco, 7729 Lawrence Road, Boynton, Beach, FL 33436 or other Architect approved supplier, and shall match Architect-approved sample and mockup panel. Shape of aggregate shall resemble spheres and cubes. Flat, slivery stones which may become dislodged easily shall not be used.

## 2.7 CONCRETE FINISH RETARDER

A. Spray applied, film forming, water based top surface retarder, calibrated for specific sized aggregate and finish requirements.

1. Acceptable Materials: “Top Cast” manufactured by W.R. Grace & Co. 62 Whittemore Ave., Cambridge, MA 02140. 800-354-5414 x 5439, 703-626-1577; or approved equal.

B. Spray applied film forming protective coating for surfaces adjacent to retarded finish surfaces.

1. Acceptable Materials: “Face Off” by W.R. Grace & Co. 62 Whittemore Ave., Cambridge, Ma 02140. 800-354-5414 x 5439, 703-626-1577. or approved equal.

## 2.8 FLATWORK SEALER

A. Sealer shall be Scofield Cureseal-W Concrete Sealer, manufactured by L.M. Scofield Company; 1-800-800-9900, or approved equal. Sealer shall be subject to the approval of the Architect.

## 2.9 CURING MATERIALS

A. Curing shall be by use of curing paper.

B. Moisture-Retaining Cover: Curing paper shall be nonstaining, fiber reinforced laminated kraft bituminous product conforming to ASTM C 171. Four mil polyethylene sheeting may be substituted for curing paper.

C. Water: Potable.

## 2.10 RELATED MATERIALS

A. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

B. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to requirements.

## 2.11 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M[ and ASTM C 1116]. Furnish batch certificates for each batch discharged and used in the Work.

1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

## 2.12 EXPANSION JOINTS

A. Expansion joints shall be located as indicated on the Drawings.

B. Expansion joints shall be cold formed with thickened edges. Expansion joints shall be doweled where indicated on the Drawings.

C. Round Expansion Joint Dowels: ASTM A615, Grade 60, epoxy-coated, smooth, billet-steel bars, clean and free of rust and scale.

## 2.13 CONTROL JOINTS

A. Control joints indicated on the Drawings to be sawn, shall be made by saw cutting concrete slab after concrete is finished and when the surface is stiff enough to support the weight of workmen without damage to the slab. Saw blade shall cut into slab at least 2 in., but in no case less than 1/3 of slab depth.

B. Unless otherwise indicated on the Drawings, control joints shall be located 10 ft. o.c. maximum.

## 2.14 CONSTRUCTION JOINTS

A. Transverse construction joints shall be placed whenever placing of concrete is suspended for more than 30 minutes.

1. Butt joint with dowels or thickened edge joint shall be used if construction joints occur at locations of control joints.
2. Keyed joints with tie bars shall be used if the joint occurs at any other location.

## 2.15 GROUT

A. Grout shall be mixed in the proportions of one part Portland cement to two parts sand, by volume. Only sufficient water shall be used to enable grout to barely hold its shape when squeezed into a ball in the hand. Sand for grout shall be "Fine Aggregate", conforming to ASTM C 33.

B. Nonshrink grout shall be pre-mixed non-shrinking, high strength grout. Compressive strength in 28 days shall be 5,000 psi minimum, but in no case less than the specified strength of the adjacent concrete. Manufacturer shall provide evidence that the material meets the requirements of the COE CRD-C 621 (558). Grout permanently exposed to view shall be nonoxidizing; metallic grout may be used in other locations.

1. Nonshrink grout shall be one of the following, or approved equal:

| Manufacturer: | Product: |
|---|---|
| Gifford-Hill Co. | Supreme |
| Master Builders Co. | Embeco |
| U.S. Grout Corporation | Five Star Grout |

## 2.16 BOND BREAKER

A. Bond breaker shall be asphalt felt conforming to ASTM D 226, Type I or 6 mil polyethylene sheeting.

## PART 3 - EXECUTION

### 3.1 GRADING

A. Areas to be paved will be compacted and brought approximately to subgrade elevation under Section 31 20 00, EARTH MOVING before work of this section is performed. Final fine grading, filling, and compaction of subgrade to receive paving, as required to form a firm, uniform, accurate, and unyielding subgrade at required elevations and to required lines, shall be done under this Section.

B. Existing subgrade material which will not readily compact as required shall be removed and replaced with satisfactory materials. Additional materials needed to bring subgrade to required line and grade and to replace unsuitable material removed shall be material conforming to Section 31 20 00, EARTH MOVING.

C. Subgrade of areas to be paved shall be recompacted as required to bring top 8 in. of material immediately below base course to a compaction of at least 90% of maximum density, as determined by ASTM D 1557, Method D. Subgrade compaction shall extend for a distance of at least 1 ft. beyond pavement edge.

D. Excavation required in pavement subgrade shall be completed before fine grading and final compaction of subgrade are performed. Where excavation must be performed in completed subgrade or subbase subsequent backfill and compaction shall be performed as directed by the Architect as specified in Section 31 20 00, EARTH MOVING. Completed subgrade after filling such areas shall be uniformly and properly graded.

E. Areas being graded or compacted shall be kept shaped and drained during construction. Ruts greater than or equal to 2 in. deep in subgrade, shall be graded out, reshaped as required, and recompacted before placing pavement.

F. Materials shall not be stored or stockpiled on subgrade.

G. Disposal of debris and other material excavated and/or stripped under this section, and material unsuitable for or in excess of requirements for completing work of this Section shall conform to the following:

1. Material shall be legally disposed of off-site.

H. Prepared subgrade will be inspected by the Architect. Subgrade shall be approved by the Architect before installation of paving base course. Disturbance to subgrade caused by inspection procedures shall be repaired under this Section of the specification.

## 3.2 AGGREGATE BASE COURSE

A. Aggregate base course for paving and the spreading, grading, and compaction methods employed shall conform to standard requirements for usual base course of this type for first class road work, and the following:

1. Refer to Section 31 20 00, EARTH MOVING and FDOT Standard Specifications Section 230.

B. Portions of subgrade or of construction above which become contaminated, softened, or dislodged by passing of traffic, or otherwise damaged, shall be cleaned, replaced, and otherwise repaired to conform to the requirements of this specification before proceeding with next operation.

## 3.3 EDGE FORMS AND SCREED CONSTRUCTION

A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides for pavement to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.

B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

## 3.4 REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

B. Before being placed in position, reinforcing for reinforced concrete shall be thoroughly cleaned of loose mill and rust scale, dirt, ice, and other foreign material which may reduce the bond between the concrete and reinforcing. Where there is delay in placing concrete after reinforcement is in place, bars shall be reinspected and cleaned when necessary.

C. Any bar showing cracks after bending shall be discarded.

D. Unless otherwise indicated on the Drawings, reinforcing shall extend within 2 in. of formwork and expansion joints. Reinforcing shall continue through control joints. Adjacent sheets of fabric reinforcing shall lap 6 in.

E. After forms have been coated with form release agent, but before concrete is placed, reinforcing steel anchors shall be securely wired in the exact position called for, and shall be maintained in that position until concrete is placed and compacted. Chair bars and supports shall be provided in a number and arrangement satisfactory to the Architect.

F. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

## 3.5 CONCRETE PLACEMENT

A. Paving mix, equipment, methods of mixing and placing, and precautions to be observed as to weather, condition of base etc., shall meet the requirements of ACI 325.9R. Pavement shall be constructed in accordance with the Drawings.

B. The Architect shall be notified of concrete placement sufficiently in advance of start of operation to allow his representative to complete preliminary inspection of the work, including subgrade, forms, and reinforcing steel, if used.

C. Normal concrete placement procedures shall be followed. Concrete shall arrive at the jobsite so that no additional water will be required to produce the desired slump. When conditions develop that require addition of water to produce the desired slump, permission of the Architect must be obtained. The concrete shall be transported from the mixer to its place of deposit by a method that will prevent segregation or loss of material. Concrete shall be placed in accordance with ACI 304.

D. Concrete shall be consolidated by suitable means to eliminate voids and pockets.

E. The strike-off and darby or bullfloat operations should be such that a level surface is obtained sufficiently below the final finish grade to allow for volume growth due to the addition of the seeding aggregate.

F. Expansion joints shall be formed in the concrete to required width with preformed joint filler in place. Depth of filler shall be as required to form a 5/8 in. deep sealant and backer rod recess below finished surface of walkway.

## 3.6 MONOLITHIC EXPOSED-AGGREGATE FINISH

A. Monolithic Exposed-Aggregate Finish: Expose coarse aggregate in pavement surfaces as follows:

1. If the drawings indicate special aggregates; following screeding, hand seed or broadcast special aggregates in such a manner as to match approved mock-up sample. Once special aggregate is placed in the top surface of the concrete begin bull floating.

2. Immediately after float finishing, spray-apply chemical surface retarder to pavement according to manufacturer's written instructions. (Surface retarder may be used, only after approval by the Architect and shall be of the same brand used to prepare the approved sample panel. The retarder shall be applied uniformly over the concrete surface and in accordance with the manufacturer's instructions.)

3. If recommended by surface retarder manufacturer, cover pavement surface with plastic sheeting, sealing laps with tape, and remove when ready to continue finishing operations.

4. When the concrete is hard enough to retain the aggregate and the mortar is still soft enough to be removed by brushing, the surface retarder shall be removed by brushing and flushing with water. The exposing operation of washing and brushing with a stiff- bristle broom and pressure washer shall continue until the surface matches the approved sample panel. The final washing operation shall cease when the flush water runs clear, there is no noticeable cement film on the aggregate, and cement film is removed from aggregate surfaces to depth required.

B. Light Sand Blast Finish: Provide light sand blast finish, lightly exposing fine aggregate with no reveal, as on Architect's sample panel, approved sample, and mockup installation. Finish shall be free of surface defects such as migrated entrained air or entrapped air bubbles over 1/8 in. diameter, sand streaks, staining, lack of uniformity of color or finish, blotches, wash, form leakage or honeycomb, and physical damage, any of which shall be deemed cause for rejection.

## 3.7 CURING AND SEALING

A. As soon as the washing operation ceases, the curing operation shall begin. The concrete shall be kept in continuously moist condition by covering with new, unwrinkled, non- staining, high-quality curing paper for 5 days in warm weather (70 deg. F. or higher) or 7 days in cooler weather (50-70 deg. F.). The temperature of the concrete shall not be allowed to fall below 50 deg. F. during the curing period.

1. During periods of excessively hot weather (95 deg. F., or above) ingredients in the concrete shall be cooled insofar as possible and cold mixing water shall be used to maintain the temperature of the concrete at permissible levels all in accordance with the provisions of ACI 305. Any concrete with a temperature above 95 deg. F. when ready for placement will not be acceptable, and will be rejected.

B. After curing is completed, concrete surface shall be protected by applying concrete sealer in accordance with manufacturer’s printed instructions.

## 3.8 CONSTRUCTION JOINTS

A. Construction Joints: Set construction joints at side and end terminations of pavement and at locations where pavement operations are stopped for more than one-half hour unless pavement terminates at isolation joints.

1. Continue steel reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of pavement strips, unless otherwise indicated.
2. Provide tie bars at sides of pavement strips where indicated.
3. Butt Joints: Use epoxy bonding adhesive at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

## 3.9 EXPANSION JOINTS

A. Expansion joints (isolation joints) shall be cold formed with thickened edges as indicated on the Drawings.

B. Where indicated, expansion joints shall be doweled. Dowel shall be centered over the joint prior to concrete placement. The end of the dowel at the side of joint which will be poured second shall be greased immediately before concrete placement.

## 3.10 CONTROL JOINTS

A. Joints shall be sawn as soon as the concrete will withstand the energy of sawing without raveling or dislodging aggregate particles. For most concrete mixtures, this means sawing should be completed within the first 6 to 18 hours and never delay more than 24 hours. Early-entry saws may be used to allow cutting to begin within a few hours after placement.

B. Control joints indicated shall be sawn 1/8 in. wide by using a diamond blade concrete power saw. Saw shall cut into slab at least 1/3 of slab depth. Saw cut joints shall be straight and accurate to line.

1. Saw cut joints shall be sawn flush to vertical surfaces.

## 3.11 DECORATIVE SAW CUT JOINTS

A. Unless otherwise indicated, decorative saw cut joints shall be sawn into the concrete slab at intervals and patterns indicated on the Drawings. Joint shall be made after concrete is finished and when the surface is stiff enough to support the weight of workmen without damage to the slab, but before slab has achieved its final set. Saw cut joints shall be straight and accurate to line.

1. Saw cut joints shall be sawn flush to vertical surfaces.

B. Decorative saw cut joints shall be located each way to create scoring patterns indicated on the Drawings.

C. Depth of decorative saw cut joint shall be 1/3 of slab depth.

## 3.12 HANDICAP RAMPS

A. Paving mix, equipment, methods of mixing and placing, and precautions to be observed as to weather, condition of base etc., shall meet the requirements of ACI 316 for any concrete paving in similar conditions. Handicap ramps shall be constructed in accordance with the Drawings, and ADA Guidelines 4.7.10, and 4.29.2.

## 3.13 HOT WEATHER CONCRETING

A. Concrete just placed shall be protected from the direct rays of the sun and the forms and reinforcement just prior to placing shall be sprinkled with cold water. Every effort shall be made to minimize delays which will result in excessive mixing of the concrete after arrival on the job.

B. During periods of excessively hot weather (95$^{O}$F., or above), ingredients in the concrete shall be cooled insofar as possible and cold mixing water shall be used to maintain the temperature of the concrete at permissible levels all in accordance with the provisions of ACI 305. Any concrete with a temperature above 95$^{O}$F., when ready for placement will not be acceptable, and will be rejected.

C. Temperature records shall be maintained throughout the period of hot weather giving air temperature, general weather conditions (calm, windy, clear, cloudy, etc.) and relative humidity. Records shall include checks on temperature of concrete as delivered and after placing in forms. Data should be correlated with the progress of the work so that conditions surrounding the construction of any part of the structure can be ascertained.

## 3.14 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least 1 composite sample for each 100 cu. yd. or fraction thereof of each concrete mix placed each day.
    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mix.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
6. Compressive-Strength Tests: ASTM C 39/C 39M; test 1 specimen at 7 days and 2 specimens at 28 days.
    a. A compressive-strength test shall be the average compressive strength from 2 specimens obtained from same composite sample and tested at 28 days.

C. Strength of each concrete mix will be satisfactory if average of any 3-consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.

E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive

device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.

G. Remove and replace concrete pavement where test results indicate that it does not comply with specified requirements.

H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

## 3.15 PROTECTION OF CONCRETE SURFACES

A. Concrete surfaces shall be protected from traffic or damage until surfaces have hardened sufficiently. If necessary 1/2 in. thick plywood sheets shall be used to protect the exposed surface.

B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

## 3.16 CONSTRUCTION WASTE MANAGEMENT

A. Comply with the requirements of Section 01 74 19, CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL for removal and disposal of construction debris and waste.

1. Do not allow excavated materials to accumulate on-site.

**END OF SECTION**

# SECTION 32 13 73

# CONCRETE PAVING JOINT SEALANTS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:

1. Cold-applied joint sealants.
2. Hot-applied joint sealants.
3. Cold-applied, fuel-resistant joint sealants.
4. Hot-applied, fuel-resistant joint sealants.
5. Joint-sealant backer materials.
6. Primers.

B. Related Requirements:

1. Section 07 92 00 "Joint Sealants" for sealing nontraffic and traffic joints in locations not specified in this Section.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product, to be approved by the Engineer and the Architect.

B. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch-wide joints formed between two 6-inch-long strips of material matching the appearance of exposed surfaces adjacent to joint sealants. To be approved by the Engineer and the Architect.

C. Paving-Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

## 1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.
B. Product Certificates: For each type of joint sealant and accessory.

## 1.5 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

B. Product Testing: Test joint sealants using a qualified testing agency.

## 1.6 FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint- sealant manufacturer or are below 60 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

## PART 2 - PRODUCTS

### 2.1 MATERIALS, GENERAL

Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

### 2.2 COLD-APPLIED JOINT SEALANTS

Single-Component, Nonsag, Silicone Joint Sealant: ASTM D 5893/D 5893M, Type NS.

Single-Component, Self-Leveling, Silicone Joint Sealant: ASTM D 5893/D 5893M, Type SL.

### 2.3 COLD-APPLIED, FUEL-RESISTANT JOINT SEALANTS

Fuel-Resistant, Single-Component, Pourable, Modified-Urethane, Elastomeric Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Use T.

Fuel-Resistant, Multicomponent, Pourable, Modified-Urethane, Elastomeric Joint Sealant: ASTM C 920, Type M, Grade P, Class 12-1/2 or 25, for Use T.

### 2.4 JOINT-SEALANT BACKER MATERIALS

A. Joint-Sealant Backer Materials: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.

B. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D 5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.

### 2.5 PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine joints to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint- sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

A. Surface Cleaning of Joints: Before installing joint sealants, clean out joints immediately to comply with joint-sealant manufacturer's written instructions.

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

### 3.3 INSTALLATION OF JOINT SEALANTS

A. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions.

C. Install joint-sealant backings to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of joint-sealant backings.
2. Do not stretch, twist, puncture, or tear joint-sealant backings.
3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install joint sealants immediately following backing installation, using proven techniques that comply with the following:

1. Place joint sealants so they fully contact joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:

1. Remove excess joint sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.

F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

## 3.4 CLEANING AND PROTECTION

A. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.

B. Protect joint sealants, during and after curing period, from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

**END OF SECTION 32 13 73**

# SECTION 32 14 13

# CONCRETE UNIT PAVING

## PART 1 GENERAL

### 1.0 RELATED DOCUMENTS

A. The PROCUREMENT AND CONTRACTING REQUIREMENTS, and applicable parts of DIVISION 01 - GENERAL REQUIREMENTS, as listed in the Table of Contents, shall be included in and made a part of this Section.

### 1.1 WORK INCLUDED

A. Provide all equipment and materials and do all work necessary to construct the concrete unit paving, as indicated on the Drawings and as specified herein. Concrete unit paving includes:

1. Concrete pavers on sand bed over compacted aggregate base.
2. Concrete pavers at Amenity Deck: on mortar bed on concrete base with hand tight joints.

### 1.2 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 31 22 00 Grading.
2. Section 31 23 00 Excavation, Backfilling and Compaction.
3. Section 32 16 00 Concrete Paving, Walks, Curbs and Gutters.
4. Section 07 00 00 Modified Bituminous Sheet Membrane Waterproofing.
5. Section 07 92 00 Sealants.

### 1.3 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirement shall govern.

1. American Association of State Highway and Transportation Officials (AASHTO): Specifications Standard Specifications for Highway Bridges
   M 43 Standard Size of Coarse Aggregate for Highway Construction

2. American Society for Testing and Materials (ASTM):

ASTM C-150 - Specification for Portland Cement.
ASTM C-127 - Test method for specific gravity and absorption of Course Aggregates.
ASTM C-128 - Test method for specific gravity and absorption of Fine Aggregates.
ASTM C-136 - Test method for sieve analysis of Fine and Course Aggregates.
ASTM C-140 - Testing for sampling and testing Concrete masonry and related units.
ASTM C-293 - Flexural Strength.
ASTM C-1028 - Static Coefficient of Friction.
ASTM C-1262 - Test Method for Evaluating Freeze-Thaw Durability.
WTCL 99 - Load Carrying Capacity.

3. Americans with Disabilities Act (ADA): Appendix to Part 1191 - Accessibility Guidelines for Buildings and Facilities

4. Florida Department of Transportation (FDOT): Specifications - Standard Specifications for Road and Bridge Construction

5. National Concrete Masonry Association (NCMA): A-10 - Solid Concrete Masonry Paving Units

## 1.4 SUBMITTALS

A. Manufacturer's Product Data: Manufacturer's product data shall be submitted for the following items:

Concrete paver Polymeric Sand
Latex polymer mortar additive

B. Submit a minimum of six (6) concrete pavers of each type and size required to Architect for approval. Samples shall exhibit the full color range of pavers to be provided.

C. Test Report:

1. Test report of precast concrete paver shall be submitted.
2. Testing shall be done by an independent testing laboratory. Test procedures shall conform to ASTM C 936 methods, where applicable.
3. Test report shall indicate, as a minimum, the following:
   a. Compressive strength, psi.
   b. Absorption, 5 hr. submersion in cold water.
   c. Absorption, 24 hr. submersion in cold water.
   d. Maximum saturation coefficient.
   e. Initial rate of absorption (suction).
   f. Abrasion index.
   g. Freeze-thaw.

**D.** Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names, and addresses of Architects and owners, and other information.

**FIELD MOCK-UP**

E. Prior to start of concrete unit pavers, the Contractor shall construct a sample panel of each concrete paver application for use as a prototype. Sample panels shall be 5 ft.x 5 ft. minimum. Panel shall exhibit the specified base, setting method, thickness, colors, jointing, pattern, finish, and workmanship. The Contractor shall not proceed with the concrete unit paving work until the Architect has approved each sample panel. If panel is not acceptable, the Contractor shall construct additional panels as required until an acceptable panel is obtained.

1. Protect accepted mock-ups from damage until project completion.
2. Accepted mock-ups shall remain on site throughout the duration of the Project. Remove mock- up panels from site at completion of project, as directed by the Architect.

F. Notify Architect seven days in advance of dates and times when mockups will be constructed.

## 1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: All products covered under this Section shall be produced by a single manufacturer, unless otherwise specified, with a minimum of fifteen (15) years proven production of this concrete paver product.

B. Installer Qualifications: Installer shall have a minimum of five (5) years proven specialized construction experience with this product and be capable of estimating and building from blueprint plans and details, in addition to proper material handling. All work must comply with local, state/provincial licensing and bonding requirements.

C. Source Limitations: Obtain each type of unit paver, joint material, and setting material from one source with resources to provide materials and products of consistent quality in appearance and physical properties.

D. Preconstruction Compatibility and Adhesion Testing: Submit to latex-additive manufacturer, for testing indicated below, samples of paving materials that will contact or affect mortar and grout that contain latex additives.

1. Use manufacturer's standard test methods to determine whether mortar and grout materials are required to obtain optimum adhesion with, and will be nonstaining to, installed pavers and other materials constituting paver installation.
2. Submit a sufficient number of pavers and other materials involved in installation to allow comprehensive testing.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain mortar and grout manufacturer's written instructions for corrective measures, including the use of alternative materials to obtain optimum bond and prevent staining.

## 1.6 PROJECT CONDITIONS

A. Weather Limitations for Mortar and Grout: Comply with the following requirements:

1. Hot-Weather Requirements: Protect unit paver work when temperature and humidity conditions produce excessive evaporation of setting beds and grout. Provide artificial shade and windbreaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F (38 deg C) and higher.
   a. When ambient temperature exceeds 100 or 90 deg F (38 or 32 deg C) with a wind velocity greater than 8 mph (13 km/h), set pavers within 1 minute of spreading setting-bed mortar.

### 1.7 DELIVERY, STORAGE, AND HANDLING

A. Pavers shall be carefully packed and loaded for shipment and all necessary precautions taken against damage in transit and handling.

B. Aggregate materials shall be kept dry and free from soiling.

C. Pavers damaged in any manner will be rejected and replaced with new materials at no additional cost to the Owner.

## PART 2 PRODUCTS

### 2.1 MATERIAL REQUIREMENTS

A. The pressed paver system shall include the following components: *Portland Cement:* ASTM C-150 specifications for Portland Cement

B. *Aggregates:* All aggregates are tested in accordance with ASTM C127, ASTM C128, and ASTM C-136 specifications. Aggregate shall be blended to meet individual project requirements.

C. *Coloring:* Pigments used shall be inorganic and alkali resistant and used per manufacturer's recommendations.

D. *Factory Applied Sealer:* Colorless slip and stain resistant penetrating or acrylic sealer.

### 2.2 PEFORMANCE REQUIREMENTS

**Performance Requirements based on 24"x24"x2" pressed paver*

A. *Compressive Strength:* (ASTM C-140) The average compressive strength shall not be less than 9,500 psi with no individual unit less than 8,000 psi.

B. *Water Absorption:* (ASTM C-140) The average shall not be greater than 4 percent.

C. *Flexural Strength:* (ASTM C-293) Shall not be less than 800 psi.

D. *Center Load:* (WTCL 99) Pressed paver units shall have a tested center load capacity of 2,000 lbs.

E. *Freeze/Thaw:* (ASTM C-1262) Durability of the pressed paver shall meet the freeze/thaw tests per Section 8, shall have no breakage and not greater than 1 percent loss in dry weight of any individual unit when subject to 100 cycles of freeze/thaw.

F. *Static Coefficient of Friction:* (ASTM C-1028): Wet: $\geq$ 0.50 and Dry: $\geq$ 0.60

G. *Sizing Dimensions:* Shall not differ by more than 1/16 inch (1.6 mm) from width, height, length or thickness. Unit shall conform to a true plane and not differ by more than 1/16 inch (1.6 mm) in either concave and/or convex warpage.

### 2.3 AGGREGATE BASE

A. Material for aggregate base course: FDOT Specifications Section 911-2.23, "Limerock Composition". Refer to Section 312000, EARTH MOVING.

## 2.4 CONCRETE PAVERS

A. Precast Concrete Pavers: shall be Tectura Designs, manufactured by Wausau Tile, Inc. PO Box 1520 Wausau, WI 54402-1520 Phone: (715) 359-3121; Toll Free: (800) 388-8728; Fax:(715) 355- 4627; General E-Mail: wtile@wausautile.com; Website: www.wausautile.com, or approved equal.

1. Pavers shall be shapes and sizes indicated on the Drawings. Color and finish shall be as indicated on the Drawings.

## 2.5 SAND

A. Sand shall be a clean, sharp, natural sand conforming to ASTM C 33, except that the fineness modulus shall be 2.25 ± 0.10.

1. Setting Bed Sand: Gradation for setting bed sand shall be as follows:

| Sieve Size | % Passing by Weight |
|---|---|
| 9.6 mm | 100 |
| No. 4 | 95 - 100 |
| No. 8 | 80 - 100 |
| No. 16 | 50 - 85 |
| No. 50 | 10 - 30 |
| No. 100 | 5 - 15 |
| No. 200 | 0 - 10 |

## 2.6 SAND JOINT FILLER

A. Joint filler shall be Hanover Polymeric Sand for Paving Joints, manufactured by Hanover Architectural Products, Inc., Hanover, PA 17331, or approved equal. Provide the following type:

1. HP POLYMERIC SAND: high-performance mix made of the latest-generation of polymers; specially formulated for the filling of paver or slab joints in heavy-traffic areas. Maximum width: 2.5 cm (1"); a larger joint width is acceptable where the pavers intersect. Minimum depth: 3 cm (1.25").

## 2.7 SETTING BED MORTAR

A. Setting bed mortar shall be equal to "Laticrete 3701 Fortified Mortar Bed", a polymer fortified blend of carefully selected polymers, portland cement and graded aggregates, manufactured by Laticrete International, Inc., One LATICRETE Park North, Bethany, CT 06524-3423 USA · 1.800.243.4788 · +1.203.393.0010, or approved equal. Mix with water according to manufacturer's instructions.

## 2.8 THIN SET BED AND/OR BOND COAT

A. High strength bond coat between concrete base slab and setting bed mortar, and between setting bed mortar and brick paver shall be equal to "Laticrete 254 Platinum", one-step, polymer fortified, thin-set mortar bond coat, manufactured by Laticrete International, Inc., One LATICRETE Park North, Bethany, CT 06524-3423 USA · 1.800.243.4788 · +1.203.393.0010, or approved equal.

## 2.9 WATER

A. Water shall be potable and shall be free of injurious contaminants.

## 2.10 SURFACE SEALANT

A. Surface sealant shall be StainBLOCKER, a water based single component polymer sealant manufactured by BP Pro, P.O. Box 17147, Irvine, CA 92623-7147; Tel. 1-866-612- 7776, or approved equal.

# PART 3 EXECUTION

## 3.1 GRADING

A. Areas to be paved will be compacted and brought approximately to subgrade elevation under Section 312000, EARTH MOVING before work of this section is performed. Final fine grading, filling, and compaction of subgrade to receive paving, as required to form a firm, uniform, accurate, and unyielding subgrade at required elevations and to required lines, shall be done under this Section.

B. Existing subgrade material which will not readily compact as required shall be removed and replaced with satisfactory materials. Additional materials needed to bring subgrade to required line and grade and to replace unsuitable material removed shall be material conforming to Section 312000, EARTH MOVING.

Subgrade of areas to be paved shall be recompacted as required to bring top 8 in. of material immediately below base course to a compaction of at least 90% of maximum density, as determined by ASTM D 1557, Method D. Subgrade compaction shall extend for a distance of at least 1 ft. beyond pavement edge.

C. Excavation required in pavement subgrade shall be completed before fine grading and final compaction of subgrade are performed. Where excavation must be performed in completed subgrade or subbase subsequent backfill and compaction shall be performed as directed by the Architect as specified in Section 312000, EARTH MOVING. Completed subgrade after filling such areas shall be uniformly and properly graded.

D. Areas being graded or compacted shall be kept shaped and drained during

construction. Ruts greater than or equal to 2 in. deep in subgrade, shall be graded out, reshaped as required, and recompacted before placing pavement.

E. Materials shall not be stored or stockpiled on subgrade.

F. Disposal of debris and other material excavated and/or stripped under this section, and material unsuitable for or in excess of requirements for completing work of this Section shall conform to the following:

1. Material shall be legally disposed of off-site.

G. Prepared subgrade will be inspected by the Architect. Subgrade shall be approved by the Architect before installation of paving base course. Disturbance to subgrade caused by inspection procedures shall be repaired under this Section of the specification.

## 3.2 AGGREGATE BASE COURSE

A. Aggregate base course for paving and the spreading, grading, and compaction methods employed shall conform to standard requirements for usual base course of this type for first class road work, and the following:

1. Refer to Section 31 20 00, EARTH MOVING and FDOT Standard Specifications Section 230.

B. Portions of subgrade or of construction above which become contaminated, softened, or dislodged by passing of traffic, or otherwise damaged, shall be cleaned, replaced, and otherwise repaired to conform to the requirements of this specification before proceeding with next operation.

## 3.3 PAVING INSTALLATION, GENERAL

A. Do not use unit pavers with chips, cracks, voids, discolorations, and other defects that might be visible or cause staining in finished work.

B. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.

C. Cut unit pavers with motor-driven masonry saw equipment to provide clean, sharp, unchipped edges. Cut units to provide pattern indicated and to fit adjoining work neatly. Use full units without cutting where possible. Hammer cutting is not acceptable.

D. Joint Pattern: As indicated on the Drawings.

E. Tolerances: Do not exceed 1/32-inch (0.8-mm) unit-to-unit offset from flush (lippage) nor 1/8 inch in 10 feet (3 mm in 3 m) from level, or indicated slope, for finished surface of paving.

## 3.4 SETTING CONCRETE PAVERS - SAND SETTING BED

A. Setting shall be done by competent workmen under adequate supervision, and in accordance with manufacturer's recommendations. Pavers shall be placed on the setting bed, to true line and plane and in required position.

B. Pavers with chips, cracks, or other structural or aesthetic defects shall not be used.

C. Sand shall be spread over compacted aggregate base as a setting bed for pavers.

D. Screed sand bed to a thickness of 1 to 1-1/2 inches (25 to 38 mm), taking care that moisture content remains constant and density is loose and constant until pavers are set and compacted.

E. Treat leveling base with soil sterilizer to inhibit growth of grass and weeds.

F. Surface tolerance shall be within 1/4 in. of required grade as measured with a 10 ft. straightedge in both the transverse and longitudinal directions.

G. Setting bed shall be protected from damage prior to setting pavers.

H. Set pavers with a maximum of 1/16 inch, being careful not to disturb leveling base. If pavers have spacer bars, place pavers hand tight against spacer bars. Use string lines to keep straight lines.

1. When installation is performed with mechanical equipment, use only unit pavers with spacer bars on sides of each unit.

I. Vibrate pavers into leveling course with a low-amplitude plate vibrator capable of a 3500- to 5000-lbf (16- to 22-kN) compaction force at 80 to 90 Hz. Perform at least three passes across paving with vibrator. Vibrate under the following conditions:

1. After edge pavers are installed and there is a completed surface or before surface is exposed to rain.
2. Before ending each day's work, fully compact installed concrete pavers to within 36 inches (900 mm) of the laying face. Cover open layers with nonstaining plastic sheets overlapped 48 inches (1200 mm) on each side of the laying face to protect it from rain.

J. Joint Treatment: Spread dry polymeric sand and fill joints immediately after setting. Minimum depth: 1.25".

1. Installation: Surface must be completely dry. Cover surface with product; using a push broom, sweep product so as to fill joints completely down to their full depth; sweep surface clean of polymeric sand to avoid staining during compaction.
   Joints must be filled up to the bottom of the paver chamfer or at minimum 1/8” below the top of the pavers.

2. Compaction: Compact surface at least twice with a plate vibrator. Repeat steps 1 and 2. A rubber roller attachment or carpet can be used under the plate to protect pavers or slabs from damage. Check with the paver supplier as to the suitability of compacting pavers or slabs 2 inches or less in thickness.

3. Wetting: Important: Surface must be free of polymeric sand; clean it with a fine bristle brush or a leaf blower. Wetting must be performed gradually in at least three sprayings; each time, especially during the first spraying, be sure not to flood pavement or generate run-off, as this could wash out the binder, especially on sloped sites.

   Spraying principles: Use a very fine mist so that the water falls lightly on pavement without displacing polymeric sand; take care not to aim the jet directly on the surface.

   First spraying: Dampen surface very lightly with a fine mist; this first spraying will stabilize polymeric sand on the surface and make it more absorbent for subsequent sprayings. Wait for 5 to 10 minutes.

   Subsequent sprayings: Lightly spray surface in 5 to 10 minute intervals, so as to gradually moisten joints; repeat sprayings until joints are moistened down to the bottom, and this, using a minimum amount of water; using a small screwdriver, check wetting progress in several spots by emptying a little section of polymeric sand down to the bottom of the joint.

4. Drying time: Drying time is directly influenced by ambient humidity and temperature - at least 24 hours for pedestrian areas; - at least 48 hours is recommended for vehicular areas.

   NOTE: Drying time can be considerably less in dry climates
   After application, if there is a risk of rain during drying time, protect the pavement with a tarp.

K. Where required, pavers shall be accurately cut with a masonry or concrete saw. Cut edges shall be plumb and straight. Scoring and breaking will not be acceptable.

## 3.5 SETTING CONCRETE PAVERS – MORTAR BED

A. Saturate concrete subbase with clean water several hours before placing setting bed. Remove surface water about one hour before placing setting bed.

B. Apply cement-paste bond coat over surface of concrete subbase about 15 minutes before placing setting bed. Limit area of bond coat to avoid its drying out before placing setting bed. Do not exceed 1/16-inch (1.6-mm) thickness for bond coat.

C. Apply mortar bed over bond coat immediately after applying bond coat. Mortar setting shall be 3/4 in. thick, minimum. Spread and screed setting bed to uniform thickness at subgrade elevations required for accurate setting of pavers to finished grades indicated.

D. Mix and place only that amount of mortar bed that can be covered with pavers before initial set. Cut back, bevel edge, remove, and discard setting-bed material that has reached initial set before placing pavers.

E. Concrete pavers shall be neatly cut and fitted at all perimeters and closures to fit neatly and closely, with joints uniform in thickness. Pavers shall be cut with a water-cooled, cut-off wheel masonry saw using a diamond blade. Concrete pavers with chips, cracks, stains, or other defects which might be visible in the finished work shall not be used.

F. Wet concrete pavers before laying if the initial rate of absorption exceeds 30 g/30 sq. in. (30 g/194 sq. cm) per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at the time of laying.

G. Place pavers before initial set of cement occurs. Immediately before placing pavers on setting bed, apply uniform 1/16-inch- (1.5-mm-) thick, slurry bond coat to bed or to back of each paver with a flat trowel.

H. Tamp or beat pavers with a wooden block or rubber mallet to obtain full contact with setting bed and to bring finished surfaces within indicated tolerances. Set each paver in a single operation before initial set of mortar; do not return to areas already set and disturb pavers for purposes of realigning finished surfaces or adjusting joints.

I. Joint Widths: Place pavers with hand tight joints.

J. Expansion joints shall be 1/2 in. thick.

K. Exposed surfaces shall be kept free from mortar at all times. Excess mortar shall be immediately removed before latex modified mortar can set.

## 3.6 ADJUST AND CLEAN

A. Remove and replace pavers which are broken, chipped, stained, or otherwise damaged. Remove and replace units which are misaligned or not to grade or do not match adjoining paver work. Provide new matching units, install as specified and fill joints to eliminate evidence of replacement. Repair defective and unsatisfactory joints as required to provide a neat, uniform appearance.

B. After completion of the concrete pavers, paved areas shall be thoroughly swept clean and surface shall be left unsoiled. Where required, surface shall be cleaned with water or an approved cleaner. Do not use wire brushes, acid type cleaning agents, or other cleaning compounds with caustic or harsh fillers.

## 3.7 SURFACE SEALER

A. Apply surface sealer to dry clean paver surface before filling joints. Apply two coats minimum at recommended coverage rates in strict compliance with manufacturer's published application and safety instructions.

## 3.8 CONSTRUCTION WASTE MANAGEMENT

A. Comply with the requirements of Section 017419, CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL for removal and disposal of construction debris and waste.

1. Do not allow excavated materials to accumulate on-site.

**END OF SECTION**

# SECTION 32 15 44

# CRUSHED SHELL PAVING

## PART 1 GENERAL

### 1.0 RELATED DOCUMENTS

A. The PROCUREMENT AND CONTRACTING REQUIREMENTS, and applicable parts of DIVISION 01 - GENERAL REQUIREMENTS, as listed in the Table of Contents, shall be included in and made a part of this Section.

### 1.1 WORK INCLUDED

A. Provide all equipment and materials, and do all work necessary to furnish and install the stabilized crushed coquina shell paving, including aggregate base, filter fabric and edging, as indicated on the Drawings and as specified.

### 1.3 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 01 40 00, QUALITY REQUIREMENTS; Inspection and testing.
2. Section 31 2 000, EARTH MOVING; Excavation and backfill and establishment of subgrade elevations.
3. Section 32 15 45, AGGREGATE SURFACING; Beach stone and gravel.
4. Section 32 93 00, PLANTING.
5. Section 33 41 00, STORM UTILITY DRAINAGE PIPING.

### 1.4 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. American Society for Testing and Materials (ASTM):

| | |
|---|---|
| D 1557 | Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using 10-lb. (4.54-kg) Rammer and 18-in. (475-mm) Drop |

2. Florida Department of Transportation (FDOT):

| | |
|---|---|
| Specifications | Standard Specifications for Road and Bridge Construction |

## 1.5 SUBMITTALS

A. A 1 lb. sample of crushed shell shall be submitted for the Architect's approval of material gradation and color.

B. Submit a 12 in. x 12 in sample of soil separator fabric for Architect's approval.

C. Submit 12 in. long sample section of aluminum edging material and any related fasteners and anchoring devices.

D. Product Data for organic binder material.

## 1.6 FIELD MOCK-UP

A. Prior to start crushed coquina shell paving, the Contractor shall construct a sample panel for use as a prototype. Sample panel shall be 8 ft.x 8 ft. minimum. Panel shall exhibit the specified base, thickness, color, and workmanship. Contractor shall not proceed with the crushed coquina shell paving work until the Owner has approved sample panel. Several sample panels shall be constructed using various stabilized mixes for Architect’s review and final approval.

## 1.7 TESTING AND INSPECTION

A. The Owner reserves the right to test and inspect materials and construction of crushed stone paving in accordance with the requirements of Section 01 40 00, QUALITY REQUIREMENTS.

## 1.8 PROTECTION OF TREES AND PLANTING

A. Special care shall be taken for construction of aggregate surfacing. Limited access will be permitted only for construction of the surfacing including aggregate base. Contractor shall not stockpile any materials or store any equipment on areas adjacent to the proposed surfacing and shall minimize travel of construction equipment to within layout of surfacing only.

B. Observe and maintain all tree protection fencing; Refer to Section 01 56 39, TEMPORARY TREE AND PLANT PROTECTION.

# PART 2 PRODUCTS

## 2.1 AGGREGATE BASE

A. Material for aggregate base course: FDOT Specifications Section 911-2.23, “Limerock Composition”. Refer to Section 312000, EARTH MOVING.

## 2.2 CRUSHED SHELL

A. Crushed Coquina Shell: shall be finely crushed coquina shell, of sieve analysis indicated on the Drawings, supplied by Yardco, 7729 Lawrence Road, Boynton, Beach, FL 33436, and shall match Architect-approved sample.

2.3 STABILIZER

A. Stabilizer additive shall be Enviroseal M10+50, a non-toxic, colorless, odorless, liquid organic binder capable of binding crushed aggregate screenings, manufactured by Enviroseal Corporation 1019-1021 SE Holbrook Court Port St. Lucie, Florida 34952; TOLL FREE in the USA and Canada: (800) 775-9474; TELEPHONE: (772) 335-8225; FAX: (772) 335-3991, or approved equal.

1. Typical Physical Properties:
   a. Appearance: Free Flowing, White LIQUID
   b. Polymer Type: 50% Acrylic Co-polymer Solids
   c. Bulk Density: Approximately 8.8 lbs./p/gallon

**2.4 SOIL SEPARATOR**

A. Soil separator shall be Mirafi 140N nonwoven drainage fabric manufactured by Tencate Geosynthetics, 365 South Holland Drive, Pendergrass, GA 30567; Tel 800 685 9990; Tel 706 693 2226; Fax 706 693 4400; www.mirafi.com, or approved equal.

**2.5 METAL EDGING**

A. Aluminum Edge Restraints: Extruded-aluminum edging with loops pressed from face to receive stakes at 12 inches (300 mm) o.c., and aluminum stakes 12 inches (300 mm) long for each loop. Type and size of edging is as follows:

1. Straight, 3/16 inch (4.8 mm) thick by 4 inches (100 mm) high.
2. Stakes: 10 in. spiral stakes.

**PART 3 EXECUTION**

**3.1 GRADING**

A. Areas to be paved will be compacted and brought approximately to subgrade elevation under Section 31 20 00, EARTH MOVING before work of this section is performed. Final fine grading, filling, and compaction of subgrade to receive paving, as required to form a firm, uniform, accurate, and unyielding subgrade at required elevations and to required lines, shall be done under this Section.

B. Existing subgrade material which will not readily compact as required shall be removed and replaced with satisfactory materials. Additional materials needed to bring subgrade to required line and grade and to replace unsuitable material removed shall be material conforming to Section 31 20 00, EARTH MOVING.

C. Subgrade of areas to be paved shall be recompacted as required to bring top 8 in. of material immediately below base course to a compaction of at least 90% of maximum density, as determined by ASTM D 1557, Method D. Subgrade compaction shall extend for a distance of at least 1 ft. beyond pavement edge.

D. Excavation required in pavement subgrade shall be completed before fine grading and final compaction of subgrade are performed. Where excavation must be performed in completed subgrade or subbase subsequent backfill and compaction shall be performed as directed by the Architect as specified in Section 31 20 00, EARTH MOVING. Completed subgrade after filling such areas shall be uniformly and properly graded.

E. Areas being graded or compacted shall be kept shaped and drained during construction. Ruts greater than or equal to 2 in. deep in subgrade, shall be graded out, reshaped as required, and recompacted before placing pavement.

F. Materials shall not be stored or stockpiled on subgrade.

G. Disposal of debris and other material excavated and/or stripped under this section, and material unsuitable for or in excess of requirements for completing work of this Section shall conform to the following:

1. Material shall be legally disposed of off-site.

H. Prepared subgrade will be inspected by the Architect. Subgrade shall be approved by the Architect before installation of paving base course. Disturbance to subgrade caused by inspection procedures shall be repaired under this Section of the specification.

## 3.2 AGGREGATE BASE COURSE

A. Aggregate base course for paving and the spreading, grading, and compaction methods employed shall conform to standard requirements for usual base course of this type for first class road work, and the following:

1. Refer to Section 312000, EARTH MOVING and FDOT Standard Specifications Section 230.

B. Portions of subgrade or of construction above which become contaminated, softened, or dislodged by passing of traffic, or otherwise damaged, shall be cleaned, replaced, and otherwise repaired to conform to the requirements of this specification before proceeding with next operation.

## 3.3 SOIL SEPARATOR

A. Soil separator shall be installed over compacted aggregate base. Edges of fabric shall overlap a minimum of 12 in.

## 3.4 METAL EDGING

A. Aluminum edging shall be installed at locations indicated on the Drawings. Where required, edging shall be cut square and accurately to required length.

1. Aluminum edging shall be securely staked in required position. Stakes shall be driven every 30 in. o.c. along length of edging.

2. Adjacent lengths of edging shall abut and be "locked" together with widened stake.
3. Edging shall be set plumb and vertical at required line and grade. Straight sections shall not be wavy. Curved sections shall be smooth with no kinks or sharp bends.

## 3.5 CRUSHED SHELL SURFACING

A. Crushed shell surfacing shall be done only after excavation and construction work which might injure it has been completed. Damage caused during construction shall be repaired before acceptance.

B. Mix liquid polymer stablizer with crushed shell material in accordance with manufacturer's printed instructions, and place to depth indicated on the Drawings.

C. Crushed shell surfacing shall be placed over filter fabric on compacted aggregate base.

D. Crushed shell surfacing shall be spread evenly over compacted base and filter fabric in 1-1/2 in. maximum lifts, rolled with a 3 to 5 ton steel-wheeled roller, and compacted to 95% of maximum density as determined by ASTM D 1557.

E. Crushed shell surface shall comply with ADA Requirements for slip resistance and accessibility, with a minimum static coefficient of friction of 0.6 for accessible routes and 0.8 for ramps, when tested in accordance with ASTM C1028.

F. Variations in smoothness of finished crushed shell surfacing shall be less than or equal to 1/4 in. when tested with a 10 ft. straightedge, applied both parallel to and at right angles to centerline of stone surface areas. Irregularities exceeding these amounts or which retain water on surface shall be corrected by removing defective work and replacing with new material conforming to this specification.

**END OF SECTION**

# SECTION 32 17 26

# TACTILE WARNING SURFACING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. Section Includes:

1. Cast-in-place detectable warning tiles.
2. Surface-applied detectable warning tiles.
3. Detectable warning unit pavers.

B. Related Requirements:

1. Section 32 13 13 "Concrete Paving" for concrete walkways serving as substrates for tactile warning surfacing.
2. Section 32 14 00 "Unit Paving" for unit paving installations incorporating detectable warning unit pavers specified in this Section.

### 1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples for Initial Selection: For each type of exposed finish requiring color selection.

C. Samples for Verification: For each type of tactile warning surface, in manufacturer's standard sizes unless otherwise indicated, showing edge condition, truncated-dome pattern, texture, color, and cross section; with fasteners and anchors.

### 1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For tactile warning surfacing, to include in maintenance manuals.

## 1.5 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
   1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

## 1.6 PROJECT CONDITIONS

A. Weather Limitations for Adhesive Application:

   1. Apply adhesive only when ambient temperature is within temperature ranges provided by the Manufacturer. Do not apply when substrate is wet or contains excess moisture.

## 1.7 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of tactile warning surfaces that fail in materials or workmanship within specified warranty period.

   1. Failures include, but are not limited to, the following:

      a. Deterioration of finishes beyond normal weathering and wear.
      b. Separation or delamination of materials and components.

   2. Warranty Period: Five years from date of Substantial Completion.

# PART 2 - PRODUCTS

## 2.1 TACTILE WARNING SURFACING, GENERAL

A. Accessibility Requirements: Comply with applicable provisions in 2012 Florida Accessibility Code (2012 FAC) for tactile warning surfaces.

   1. For tactile warning surfaces composed of multiple units, provide units that when installed provide consistent side-to-side and end-to-end dome spacing that complies with requirements.

B. Source Limitations: Obtain each type of tactile warning surfacing, joint material, setting material, anchor, and fastener from single source with resources to provide materials and products of consistent quality in appearance and physical properties.

## 2.2 DETECTABLE WARNING TILES

A. Cast-in-Place Detectable Warning Tiles: Accessible truncated-dome detectable warning tiles with replaceable surface configured for setting flush in new concrete walkway surfaces, with slip-resistant surface treatment on domes and field of tile.
   1. Material: Cast-fiber-reinforced polymer concrete tile.
   2. Color: Safety yellow or as selected by Architect from manufacturer's full line.
   3. Shapes and Sizes:
      a. Rectangular panel, nominal 24 inches deep with dimensions as needed to install appropriately per 2012 FAC.
      b. Radius panel, nominal 24 inches deep with outside radius as needed.

   4. Dome Spacing and Configuration: Shall comply with the 2012 FAC.
   5. Mounting:

      a. Permanently embedded detectable warning tile wet-set into freshly poured concrete.

B. Surface-Applied Detectable Warning Tiles: Accessible truncated-dome detectable warning concrete tiles configured for surface application on existing concrete walkway surfaces, with slip-resistant surface treatment on domes, field of tile, and beveled outside edges.
   1. Material: Cast-fiber-reinforced polymer concrete tile.
   2. Color: Safety yellow or as selected by Architect from manufacturer's full line.
   3. Shapes and Sizes:

      a. Rectangular panel, nominal 24 inches deep with dimensions as needed to install appropriately per 2012 FAC.
      b. Radius panel, nominal 24 inches deep with outside radius as needed.

   4. Dome Spacing and Configuration: Shall comply with the 2012 FAC.
   5. Mounting: Adhered and fastened to installed or existing concrete walkway.

## 2.3 DETECTABLE WARNING UNIT PAVERS

A. Detectable Warning Concrete Unit Pavers: Solid paving units, made from normal-weight concrete with a compressive strength of not less than 5000 psi, water absorption of not more than 5 percent according to ASTM C 140, and no breakage and not more than 1 percent mass loss when tested for freeze-thaw resistance according to ASTM C 67, with accessible detectable warning truncated domes on exposed surface of units.

1. Shapes and Sizes: specified in drawings.
2. Dome Spacing and Configuration: Shall comply with the 2012 FAC.
3. Color: As selected by Architect from manufacturer's full range.

B. Setting Bed: Comply with requirements in Section 32 14 00 "Unit Paving."

C. Aggregate Setting Bed:

1. Graded Aggregate for Base: Sound, crushed stone or gravel complying with ASTM D 448 for Size No. 8.
2. Sand for Leveling Course: Sound, sharp, washed, natural sand or crushed stone complying with gradation requirements in ASTM C 33/C 33M for fine aggregate.
3. Sand for Joints: Fine, sharp, washed, natural sand or crushed stone with 100 percent passing No. 16 sieve and no more than 10 percent passing No. 200 sieve.

D. Mortar Setting Bed:

1. Portland Cement: ASTM C 150/C 150M, Type I or Type II.
2. Sand: ASTM C 33/C 33M.
3. Latex Additive: Manufacturer's standard water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar bed, and not containing a retarder.
4. Thinset Mortar: Latex-modified portland cement mortar complying with ANSI A118.4.
5. Water: Potable.

## 2.4 DETECTABLE WARNING INDICATORS

A. Detectable Warning Indicators to match the below product, or approved equal:
1. Manufacturer: DW Dots - Detectable Warning Systems
   a. Address: 802 Denise Lane, El Cajon, California 92020. b. Phone: (619) 582-9600
2. Model: T303
3. Installation:
   a. Per manufacturer's specifications.
   b. Layout pattern shall comply with the 2012 Florida Accessibility Code requirements.
   c. Contractor shall wash out all concrete dust and dry holes prior to installation.

## 2.5 ACCESSORIES

A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of tactile warning surfaces, noncorrosive and compatible with each material joined, and complying with the following:

1. Furnish Type 316 stainless-steel fasteners for exterior use.
2. Fastener Heads: For nonstructural connections, use flathead or oval countersunk screws and bolts with tamper-resistant heads, colored to match tile.

B. Adhesive: As recommended by manufacturer for adhering tactile warning surfacing unit to pavement.

C. Sealant: As recommended by manufacturer for sealing perimeter of tactile warning surfacing unit.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Verify that pavement is in suitable condition to begin installation according to manufacturer's written instructions. Verify that installation of tactile warning surfacing will comply with accessibility requirements upon completion.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION OF TACTILE WARNING SURFACING

A. General: Prepare substrate and install tactile warning surfacing according to manufacturer's written instructions unless otherwise indicated.

B. Place tactile warning surfacing units in dimensions and orientation indicated. Comply with location requirements of AASHTO MP 12.

### 3.3 INSTALLATION OF DETECTABLE WARNING TILES

A. Cast-in-Place Detectable Warning Tiles:

1. Concrete Paving Installation: Comply with installation requirements in Section 321313 "Concrete Paving." Mix, place, and finish concrete to conditions complying with detectable warning tile manufacturer's written requirements for satisfactory embedment of tile.
2. Set each detectable warning tile accurately and firmly in place and completely seat tile back and embedments in wet concrete by tamping or vibrating. If necessary, temporarily apply weight to tiles to ensure full contact with concrete.
3. Set surface of tile flush with surrounding concrete and adjacent tiles, with variations between tiles and between concrete and tiles not exceeding plus or minus 1/8 inch from flush.
4. Protect exposed surfaces of installed tiles from contact with wet concrete. Complete finishing of concrete paving surrounding tiles. Remove concrete from tile surfaces.
5. Clean tiles using methods recommended in writing by manufacturer.

B. Surface-Applied Detectable Warning Tiles:

1. Lay out detectable warning tiles as indicated and mark concrete pavement.
2. Prepare existing paving surface by grinding and cleaning as recommended by manufacturer.

3. Apply adhesive to back of tiles in amounts and pattern recommended by manufacturer, and set tiles in place. Firmly seat tiles in adhesive bed, eliminating air pockets and establishing full adhesion to pavement. If necessary, temporarily apply weight to tiles to ensure full contact with concrete.
4. Install anchor devices through face of tiles and into pavement using anchors located as recommended by manufacturer. Set heads of anchors flush with top surface of mat.
5. Mask perimeter of tiles and adjacent concrete, and apply sealant in continuous bead around perimeter of tile installation.
6. Remove masking, adhesive, excess sealant, and soil from exposed surfaces of detectable warning tiles and surrounding concrete pavement using cleaning agents recommended in writing by manufacturer.
7. Protect installed tiles from traffic until adhesive has set.

## 3.4 INSTALLATION OF DETECTABLE WARNING UNIT PAVERS

A. Unit Paver Installation, General:

1. Setting-Bed and Unit Paver Installation: Comply with installation requirements in Section 32 14 00 "Unit Paving."

## 3.5 CLEANING AND PROTECTION

A. Remove and replace tactile warning surfacing that is broken or damaged or does not comply with requirements in this Section. Remove in complete sections from joint to joint unless otherwise approved by Architect. Replace using tactile warning surfacing installation methods acceptable to Architect.

B. Protect tactile warning surfacing from damage and maintain free of stains, discoloration, dirt, and other foreign material.

C. Remove protective plastic coating prior to Substantial Completion review.

**END OF SECTION 32 17 26**

# SECTION 32 18 13

# SYNTHETIC GRASS SURFACING

## Part 1 – GENERAL

### 1.01 SUMMARY – WORK INCLUDED

Provide all labor, materials, equipment, and tools necessary for the complete installation of a synthetic grass playground safety surface system as outlined in these specifications. The vertical draining impact attenuating pad shall be suitable to meet the fall height of the intended equipment. The stone base, nail board and drainage substrate shall be provided separately by the general contractor. The system shall consist of, but not necessarily be limited to, the following:

A. A complete synthetic grass system, consisting of a synthetic grass with 1 5/8" inch long 100% monofilament polyethylene fibers and polyethylene thatch layer, tufted on a 3/8" tufting machine with a minimum of 82 ounces of yarn per square yard. The fibers shall include anti-static yarns, anti-bacterial additives and “cool grass” pigments to reduce the surface temperature. Synthetic turf products utilizing nylon blades or thatch layers will not be acceptable. Systems utilizing granular rubber products infilled in the grass blades will not be acceptable. The system shall include a single, dimensionally stable, two-component primary backing and have a minimum of 20 ounces of secondary polyurethane backing per square yard. The finished product shall also include perforations in a 2” by 4” pattern to ensure maximum drainage.

### 1.02 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 11 68 13, PLAYGROUND EQUIPEMENT
2. Section 31 20 00, EARTH MOVING; Excavation, backfill; establishment of subgrade elevations.
3. Section 32 18 13, SYNTHETIC GRASS SURFACING

### 1.03 QUALIFICATIONS, REFEERENCES AND SUBMITTALS

Prospective bidders and/or installers of the turf shall be required to comply with the following:

A. The turf manufacturer must be experienced in the manufacture of synthetic grass playground systems and provide references of five (5) municipal or commercial playground installations in the last three (3) years.

B. The turf installer must provide competent workmen skilled in this specific type of synthetic grass installation. The designated supervisory personnel on the project must be competent

in the installation of this material, including gluing of seams.

C. The turf installer will provide submittals of turf, shock pad, glue and seam materials as detailed in the submittals section of the specifications. These details should include the following ASTM test method for the complete system.

1. ASTM F1292-17, Standard Specification for Impact Attenuation of Surface Systems Under and Around Playground Equipment

2. ASTM F1951-09: Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment

D. Submit one 12” by 12” sample of the synthetic turf and the underlayment padding to be installed. A submission of at least one pound of the infill material to be used is also required.

E. Submit manufacturer’s certification that the products and materials comply with the requirements of the specifications. Submit test results showing compliance with the reference standards as listed in the specifications.

F. Documentation: Submit warranty and ensure that forms have been completed in Owner's name and registered with approved manufacturer. Submit a written “Certification of Acceptance of the Base Construction” from the installer of the infill turf system prior to installation of the synthetic turf system.

## PART 2 – SYNTHETIC GRASS MATERIALS

### 2.01 MANUFACTURERS

A. Acceptable Manufacturer:

PerfectPlay® Playground Safety Surface
Manufactured by Perfect Turf LLC, Wood Dale, IL 60191
Contact: 888-SYN-TURF (888-796-8873)

The PerfectPlay® System consist of:

Perfect Turf® Playground Turf™ (see addendum for specification page)
Perfect Turf® Playground Padding (manufactured by Schmitz or Polygreen)

Or approved equivalent upon approval from the principal architect.

## 2.02 MATERIAL REQUIREMENTS

The synthetic turf material shall be in accordance with the following:

A. The long fiber shall be a minimum 10,000 denier, minimum 250 micron thickness, 100% true monofilament polyethylene, low friction fiber, measuring not less than 1-5/8 inches high. The thatch fiber shall be a minimum 4,000 denier, minimum 100 micron thickness, 100% polyethylene and polyester fiber. These material specifications will be confirmed by independent lab testing:

1. ASTM D1907 Standard Test Method for Linear Density of Yarn by the Skein Method (Denier)

2. ASTM D3218 Standard Specification of Polyolefin Monofilaments (Ribbon Thickness & Width)

3. ASTM D5823 Standard Test Method for Tuft Height of Pile Yarn Floorcoverings

B. The polyester in the thatch zone fiber is required for anti-static properties. The antimicrobial additives in the long fiber and/or thatch fiber

C. The fiber shall be a two-tone grass blade, green in color with a tan thatch fiber to simulate natural grass as closely as possible and treated with UV inhibitor, guaranteed for a minimum of ten years.

D. The tufted fiber weight shall not be less than 82 ounces per square yard. The fiber shall be tufted on a 3/8" tufting machine. The low friction non-abrasive fiber shall be 100% monofilament polyethylene, treated with a UV inhibitor. These material specifications will be confirmed by independent lab testing:

1. ASTM D5848-10e1 Standard Test Method for Mass Per Unit Area of Pile Yarn Floorcoverings

E. The primary backing shall consist of a one part, two component backing. The secondary backing shall consist of an application of 20 ounces of coating per square yard heat activated to permanently lock fiber tufts in place. The total backing weight shall not be less than 26 ounces. The synthetic grass system shall be perforated to provide for maximum drainage. Non- perforated systems shall not be acceptable alternates for purposes of this specification. These material specifications will be confirmed by independent lab testing:

1. ASTM D5848-10e1 Standard Test Method for Mass Per Unit Area of Pile Yarn Floorcoverings

F. The carpet rolls shall be of sufficient length to go from side to side of the play area. Full head seams will not be acceptable unless as required to cut around equipment posts.

G. The shock attenuation pad shall be a 100% recycled, post industrial cross linked,

closed cell polyethylene-polyolefin foam material. The pad should allow for vertical and horizontal drainage.

H. The non-rubber infill shall be rounded, sub-angular silica sand from a 20-40 sieve rate. No other infills will be accepted without prior written approval by the architect and/or owner.

## PART 3 – EXECUTION AND INSTALLATION

The turf installer shall strictly adhere to the installations procedures outlined under these sections. Any variance from these requirements shall be accepted in writing by the manufacturer's representative, and submitted to the architect/owner, verifying that the changes do not in any way affect the warranty.

A. The turf installer will accept the stone base substrate prior to the installation of the synthetic turf system.

B. Extreme care should be taken to avoid disturbing the substrate in regard to planarity.

C. Playground pad shall be laid out and cut around the playground equipment so as not to leave gaps greater than ¼" between the post and the pad.

D. The full width rolls of synthetic grass shall be laid out across the area, and utilizing standard state-of-the-art gluing procedures each roll shall be seamed to the next.

E. This is a 100% glued installation. Sewing of seams will not be permitted. The seaming tape and glue shall be intended for installation of outdoor synthetic turf surfaces. The adhesive must be a polyurethane-based adhesive, latex-based adhesives are not acceptable.

F. The synthetic turf will be fastened to perimeter nail boards with triple coated 1.25" construction lag screws every 4" around the perimeter.

G. The play area will be infilled with 1.5 - 2 pounds per square foot of rounded, sub-angular silica sand and brushed with a motorized rotary nylon broom to stand up the fibers and allow the sand to settle to the bottom of the turf upon completion of the installation. At the owner's option, this step may be skipped.

## PART 4 – MAINTENANCE AND WARRANTY

The bidder and/or the turf manufacturer must provide the following:

a) The turf manufacturer shall provide a warranty to the owner that covers defects in materials and workmanship of the turf for a period of at least 10 years from the date of Substantial Completion. A ten (10) year "UV stabilization" warranty shall be included in the warranty.

b) The manufacturer's warranty shall include general wear and damage caused from UV degradation. The warranty shall specifically exclude vandalism, acts of War and acts of God beyond the control of the owner, installer, general contractor or the manufacturer.

c) The bidder shall provide a warranty to the owner that covers defects in the installation workmanship for a period of at least 2 years, and further warrant the installation was done in accordance with the manufacturer's recommendations.

d) All turf warranties shall be limited to repair or replacement of the affected areas and shall include all necessary materials, labor, transportation costs, etc. to complete said repairs. All warranties are contingent on the full payment by the owner of all pertinent invoices.

e) The turf installer and/or manufacturer's rep will provide on-site maintenance training upon substantial completion of the project. Optional maintenance equipment will be demonstrated and discussed at that time.

**END OF SECTION**

# SECTION 32 18 16

# PLAYGROUND PROTECTIVE SURFACING

## PART 1 GENERAL

### 1.01 RELATED DOCUMENTS

A. The PROCUREMENT AND CONTRACTING REQUIREMENTS, and applicable parts of DIVISION 01 - GENERAL REQUIREMENTS, as listed in the Table of Contents, shall be included in and made a part of this Section.

### 1.02 WORK INCLUDED

Provide all labor, materials, equipment, and tools necessary for the complete installation of a playground protective surface system as outlined in these specifications. The depth shall be suitable to meet the fall height of the intended equipment. The stone base and drainage substrate shall be provided separately by the general contractor. The system shall consist of, but not necessarily be limited to, the following:

### 1.03 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 11 68 13, PLAYGROUND EQUIPEMENT
2. Section 31 20 00, EARTH MOVING; Excavation, backfill; establishment of subgrade elevations.
3. Section 32 18 13, SYNTHETIC GRASS SURFACING

### 1.04 QUALIFICATIONS, REFEERENCES AND SUBMITTALS

Prospective bidders and/or installers of the turf shall be required to comply with the following:

A. The surfacing manufacturer must be experienced in the manufacture of synthetic grass playground systems and provide references of five (5) municipal or commercial playground installations in the last three (3) years.

B. The surfacing installer must provide competent workmen skilled in this specific type of poured in place installation. The designated supervisory personnel on the project must be competent in the installation of this material, including required fall heights required per play equipment and the uniformity of finished grade specified in the DRAWINGS and SPECIFICATIONS.

C. The turf installer will provide submittals of playground protective surfacing. Submittal to include samples of all possible colors for selection by principal architect before installation.

## 1.04 EXISTING CONDITIONS

A. By submitting a bid, the Contractor affirms that he has carefully examined the site and all conditions affecting work under this Section. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions.

## 1.05 QUALITY CONTROL

A. The Landscape Architect reserves the right to perform on-site observation during the playground protective surfacing installation operations. The observations may include, but not be limited to the following:

1. Observation of subgrade preparation is adequate for design intent as identified in the DRAWINGS.
2. Observation of rough and finish grading operations.
3. Observation that color is uniform.
4. Observation that color pattern is consistent with the DRAWINGS.

B. All color changes shall be staked with grade stakes at each end, any change of direction, and at 20’ centers along the length for Landscape Architect’s review prior to commencing installation operations.

C. Stake out and indicate finish grades at all major spot elevations such as high points and low points in a 25 ft. x 25 ft. grid for the playground for Landscape Architect’s review and approval prior to commencing installation operations.

## 1.06 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

A. The work shall be executed in such manner as to prevent any damage to adjacent property and any previously existing improvements such as, but not limited to: walls, curbs, paving, utility lines and structures, lighting, plant material, monuments, bench marks and other items that have been already completed in the construction operations.

B. In case of any damage or injury caused in the performance of the playground protective surfacing work, the Contractor shall, at his own expense, make good such damage or injury to the satisfaction of, and without cost to the Owner.

### 1.07 COORDINATION

A. Prior to start of grading operations, the Contractor shall arrange an on-site meeting with the Architect for the purpose of establishing Contractor's schedule of operations and scheduling inspection procedures and requirements.

B. As construction proceeds, the Contractor shall be responsible for notifying the Landscape Architect prior to start of playground protective surfacing operations requiring inspection and/or testing.

## PART 2 – SYNTHETIC GRASS MATERIALS

### 2.01 MANUFACTURERS

A. Acceptable Manufacturer: OR APPROVED EQUAL

Pro-Techs Surfacing LLC
P.O. Box 301
Sharon Center, OH, OH 44274 (330)-576-6058
info@pro-techssurfacing.com
http://www.pro-techssurfacing.com

### 2.02 PRODUCT DESCRIPTION

A. Perma-Play 2-Layer Poured-In-Place Playground Surfacing is designed for playgrounds and water play areas.

B. COMPOSITION AND MATERIALS
Perma-Play 2-Layer Poured-In-Place Playground Surfacing is a 2-layer system. The basemat material consists of 100% post-consumer recycled, 3/8” shredded, SBR (styrene butadiene rubber) and high-grade aromatic polyurethane. The top surface consists of EPDM (Ethylene Propylene Diene Monomer) rubber, with the black EPDM being recycled post-industrial material, ranging in size from 1 – 3 mm, and high-grade aromatic or aliphatic polyurethane.

C. PRODUCT DIMENSIONS:
The height of the playground equipment determines the required basemat thickness. Basemat thicknesses may vary throughout a playground site. Basemat thicknesses are determined by the “Critical Fall Height (CFH)” requirements through ASTM testing. All ASTM test results are available upon request.

Thicknesses Available
CFH 2.0” – up to 4ft.
CFH 2.75” – up to 6ft.
CFH 3.0” – up to 7ft.
CFH 3.5” – up to 8ft.

CFH 4.0" – up to 10ft.
CFH 5.0" – up to 12ft.

TOP SURFACE THICKNESS:
0.5" thickness nominally.
Installation to provide 5/8" to ¾" thick at high use areas such as the base of slides, below ladders and swings.

| **Standard Colors** | **Premium Colors** | |
|---|---|---|
| P1 Black | P8 Yellow | S42 Yellow |
| P2 Red | P9 Orange | S43 Pearl |
| P3 Blue | P10 Purple | S44 Teal |
| P4 Beige | P11 White | S47 Dark Blue |
| P5 Green | S31 Bright Green | S48 Gold |
| P6 Brown | S32 Terracotta Red | S49 Light Blue |
| P7 Grey | S33 Light Green | S51 Orange |
| | S34 Purple | S59 Tan |
| | S35 Brown | S61 Blue Grey |
| | S36 Light Grey | S62 Eggshell |
| | S38 Blue | S63 Capri Blue |
| | S39 Dark Green | S64 Signal Green |
| | S40 Light Beige | S65 Charcoal |

## 2.03 PRODUCT LIMITATIONS

A. LIMITATIONS
As a precautionary maintenance measure, a list of chemicals known to damage Perma-Play 2-Layer Poured-In-Place Playground Surfacing and similar rubber safety surfaces is available upon request.In water play areas, pool surrounds and similar applications. Pool chemicals may affect coloration of the rubber safety surface over time. This condition, should it occur, is not considered to be a product failure.

B. A "YELLOWISH" shading of the rubber top surface will be noticeable in some colors when using standard aromatic polyurethane binder. This slight yellowing is more pronounced in certain colors and is a common affect in the pour in place rubber safety surface industry. An aliphatic binder, which greatly minimizes the yellowish shading, is available at a higher cost. Both binding materials can be used on a project to maximize aesthetics with lighter colors that are affected by the yellowing and minimize cost. Consult Pro- Techs Surfacing LLC for more information.

## 2.04 TECHNICAL DATA

These details should include the following ASTM test method for the complete system.

- ASTM D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension
- ASTM D624 Standard Test Methods for Tear Strength of Conventional Vulcanized Rubber andThermoplastic Elastomers
- ASTM C1028 Standard Test Method for Determining the Static Coefficient of Friction of Ceramic Tile and Other Like Surfaces by the Horizontal Dynamometer Pull Meter Method
- ASTM D2859 Standard Test Method for Flammability of Finished Textile Floor Covering Materials
- ASTM E303 Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester
- ASTM F1292 Standard Specification for Impact Attenuation of Surface Systems Under and Around Playground Equipment
- ASTM F1951 Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment

- ENVIRONMENTAL CONSIDERATIONS
- This system makes extensive use of recycled tire rubber as a major component. PHYSICAL/CHEMICAL PROPERTIES

- Shock Attenuation (ASTM F1292)
- Gmax - Less than 200
- Head Injury Criteria – 1000 or less
- Accessibility (ASTM 1951)

- Straight Baseline Propulsion - 12.15 lbs Work/ft-Force Turning Baseline Propulsion - 7.30 lbs Work/ft-Force
- Tensile Strength (ASTM D412) – 163.18PSI
- Tear Resistance (ASTM D624) – 60.96PSI
- Dry Static Coefficient of Friction (ASTM C1028) - 0.77
- Wet Static Coefficient of Friction (ASTM C1028) - .56
- Wet Skid Resistance (ASTM E303) - Initial Dry 88.5BPN, 90 Degree Dry 96.8BPN
- Flammability (ASTM D2859) – Pass
- Water Permeability (ASTM F1551-03) gal/min/yd2 = 363.

## 2.05 TECHNICAL SERVICES

Pro-Techs Surfacing LLC works closely with the contractor to ensure the site is prepared and the installation is on schedule. For technical assistance, contact Pro-Techs Surfacing LLC.

## 2.06 QUALITY ASSURANCE

Qualifications – Utilize an installer certified and trained by the manufacturer of playground surfacing system, having experience with other projects of the scope and scale of the work described in this section.

Certifications – Certification by manufacturer that installer is an approved applicator of Perma-Play 2-Layer Poured-In-Place Playground Surfacing.

International Play Equipment Manufacturers Association (IPEMA) Certified

## PART 3 – EXECUTION AND INSTALLATION

PREPARATORY WORK EPDM Rubber materials should be protected from exposure to harmful environmental conditions (moisture) and at a minimum temperature of 50 degrees F and a maximum temperature of 90 degrees F. Install surfacing system when minimum ambient temperature is 50 degrees F and maximum ambient temperature is 90 degrees F. Basmat may be installed in a light rain. Do not install Top Coat in any type of moisture or precipitation.

The playground protective surfacing installer shall strictly adhere to the installation procedures outlined under these sections. Any variance from these requirements shall be accepted in writing by the manufacturer's representative, and submitted to the architect/owner, verifying that the changes do not in any way affect the warranty.

A. The playground protection surfacing installer will accept the stone base substrate prior to the installation of the synthetic turf system. Substrate must be in accordance with surfacing manufacturers Compacted Stone Base Installation Instructions before Perma-Play 2-Layer Poured-In-Place Playground Surfacing can be applied. Extreme care should be taken to avoid disturbing the substrate in regard to planarity.

**NOTE:** Proper drainage is crucial to the longevity of the Perma-Play 2-Layer Poured-In-Place Playground Surfacing. Inadequate drainage will cause premature breakdown of the product in affected areas; and void the warranty.

B. Perma-Play 2-Layer Poured-In-Place Playground Surfacing can not proceed until all applicable site work, including substrate preparation, fencing, playground equipment installation and other relevant work, has been completed and approved by a Pro-Techs Surfacing LLC representative.

C. Basemat Primer - Using a bristle brush, apply ample urethane primer to all curbing and or vertical substrates, which the rubber surfacing system will contact.

D. Basemat Installation - Using screed sticks and gauge poles, install the basemat rubber materials to 1/8" – 1/4" higher than required thickness. Using pool trowels, pull the basemat material together using consistent pressure

throughout. Repeat the process until all areas, including use zones, comply with the architectural plans and specification requirements. Allow basemat to cure for sufficient time (24 hours) so that indentations are not left in the basemat material. Installation contractor must verify that the basemat has cured sufficiently before applying the finished topcoat.

E. Topcoat Primer - Using a bristle brush apply urethane binder to the existing 1/2" of curbing and any other vertical structures within the installation areas, and to the basemat material at a minimum of 2" around the perimeter of the topcoat area.

F. Topcoat Installation - Screed the EPDM topcoat rubber granules to a nominal 5/8" thickness to allow for compaction. Using a pool trowel, pull together material using consistent pressure throughout to produce the end result of 1/2" thickness. Any area in excess of 2500 sf may be seamed as deemed necessary by Pro-Techs Surfacing, LLC. Any area less than 2500 sf will be completed seamlessly as conditions allow.

*** NOTE** – Allow topcoat to cure for 24 hours to 72 hours contingent on the humidity and temperature. Protect newly installed topcoat from foot traffic or equipment usage until the Perma-Play 2-Layer Poured-In- Place Playground Surfacing has fully cured. Complete installation recommendations are available from a Pro- Techs Surfacing LLC representative.

## 3.01 WARRANTY

Standard warranty period for Perma-Play 2-Layer Poured-In-Place Playground Surfacing is for 5 years from completion of installation. Contact Pro-Techs Surfacing, LLC for 7 year & 10 year warranty options.

## 3.02 MAINTENANCE AND CLEANING

Using a standard leaf blower or broom, remove any light weight debris such as leaves, trash, etc. Using a watering hose or a pressure washer, not exceeding 1000 PSI, rinse off all excess debris from the surface. While surface is wet, apply a mild cleaning detergent and agitate lightly with a soft bristle brush. Repeat as necessary. Once clean, final rinse with low-pressure water from a hose to remove any excess- cleaning agents.

**END OF SECTION**

# SECTION 32 84 00

# IRRIGATION

## PART 1 – GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.

B. Should this Section specify requirements in conflict with the Construction Drawings package, Construction Drawings package shall govern.

### 1.2 SUMMARY

A. Furnish all labor, material, equipment, supervision, and related services necessary or incidental to the installation of the Work as shown or indicated on the Drawings and/or as specified.

B. Section Includes:

1. Pipe and fittings, valves, sprinkler heads, emitters, bubblers, and accessories.
2. Control system.

### 1.3 REFERENCES

A. American Concrete Institute International (ACI):

1. ASTM B32 - Standard Specification for Solder Metal; 2003.
2. ASTM B42 - Standard Specification for Seamless Copper Pipe, Standard Sizes; 2002.
3. ASTM B88 - Standard Specification for Seamless Copper Water Tube; 2003.
4. ASTM D2235 - Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings; 2001.
5. ASTM D2241 - Standard Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR-PR); 2004.
6. ASTM D2282 - Standard Specification for Acrylonitrile-Butadiene-Styrene (ABS) plastic pipe (SDR-PR); 1999.
7. ASTM D2564 - Standard Specification for Solvent Cements for Poly (Vinyl Chloride) (PVC) plastic pipe and fittings; 2002.

B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2003.

### 1.4 SUBMITTALS

A. Shop Drawings: Indicate piping layout to water source, location of sleeves under pavement, location and coverage of sprinkler heads, components, plant and landscaping features, site structures, schedule of fittings to be used.

B. Product Data: Provide copies of equipment manufacturer’s specifications and literature for all specified

materials.

C. Record Documents: Within 15 days of completion of the Work, provide a scale drawing showing actual locations (triangulated form two fixed reference points) of all concealed components including water meters, backflow prevention devices, gate valves, control valves, in-line wire splices, sleeves, mainline routing and control wire routing. Provide one (1) hardcopy and three (3) electronic copies saved in .pdf format on individual compact disks.

D. Operation and Maintenance Data:

1. Provide on-site instruction of the operation and maintenance of system and controls, emergency shutdown, and seasonal activation and shutdown for the Owner's representative and the Owner's maintenance contractor. Also provide one (1) hardcopy and three (3) electronic copies, saved in .pdf format; of all operation and maintenance literature, material cut sheets and parts lists, and manufacturer's parts catalog.
2. Provide schedule indicating length of time each valve is required to operate to provide ½ inch of water.

## 1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Company specializing in the performance and licensed for the installation of the work of this section with minimum five years of experience. The use of unqualified personnel may result in the Contractor's removal from the project, without any extension of time, until qualified personnel can be provided.

C. Do not alter the design hydraulics by installing additional tees or elbows unless approved in writing by the Landscape Architect. Failure to get approval may cause Contractor to expose all buried pipe, at the Contractor's expense, to assure no other alterations have been made.

D. Regulatory Requirements:

1. Conform to federal, state, county and local codes and laws for the installation of landscape irrigation systems.

E. Pre-installation Meeting:

1. Convene no later than one week prior to commencing work of this Section. Coordinate conference time and location with County representative.

F. Coordination:

1. Coordinate the work with site grading, paving, structural, concrete, landscape grading and installation of plant material.

## 1.6 WARRANTY

A. Provide to the Owner warranties and guarantees provided by the manufacturer for all equipment incorporated into the Work.

B. Provide, on company letter head or Owner's standard warranty letter, a warranty on all materials and workmanship for a period of one year after final acceptance. The warranty shall include complete repair of any damage to the landscape or grade.

## 1.7 MAINTENANCE

A. Installer's Field Services: Prepare and start systems and adjust all spray patterns, flow controls, and controller programming during installation of the plant material and immediately prior to Final Acceptance.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS:

A. Per the material schedule and plan legend. No substitutions will be permitted without written authorization from the Landscape Architect.

B. Pipe Materials:

1. PVC Pipe: ASTM D 2241; 200 psi pressure rated upstream from controls, 200 psi downstream; solvent welded sockets 3" diameter and smaller with solvent welded Schedule 40 fittings, 4" and larger Class 200 gasket sealed PVC with ductile iron fittings specified for use with PVC pipe.
2. PVC Pipe: ASTM D 2241; Class 200 with solvent welded Schedule 40 fittings.
3. Copper Pipe: ASTM B 88 (ASTM B 88M), Type K (A); annealed temper.
4. Copper Tube: ASTM B 42, Type M
5. Fittings: Type and style of connection to match pipe.
6. Solvent Cement: ASTM D 2564 for PVC pipe and fittings.
7. Solder and Flux: ASTM B 32 solder, with suitable flux.
8. Sleeve Material: Class 200 or Schedule 40.

C. Valves:

1. Manufacturers:
   a. Per the material schedule and plan legend. No substitutions will be permitted without written authorization from the Landscape Architect.
2. Gate Valves: Bronze construction non-rising stem.
3. Backflow Preventers: Bronze body construction double check valve type, or per local code.
4. Valve Box and Cover: Brooks, Carson, Ametek, or per local code.

D. Controls:

1. Manufacturers:

a. Per the material schedule and plan legend. No substitutions will be permitted without written authorization from the Landscape Architect.

2. Controller: Automatic controller, microprocessor solid state control with visible readout display, temporary override feature to bypass cycle for inclement weather, programmable for 7 days in one-minute increments, with automatic start and shutdown. Whether indicated on the plans or not, all controllers will be equipped with both a rain and freeze sensor.
3. Valves: Electronic solenoid controlled; normally closed.
4. Wire Conductors: Color coded, 14 gauge minimum.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Verify location of existing utilities. Verify that required utilities are available, in proper location, and ready for use.

B. Verify that prepared subsoil, planters, on-structure decks, etc. are ready to receive work. The Contractor assumes all responsibility for the correction of work installed on improper grades.

### 3.2 PREPARATION

A. Piping layout indicated is diagrammatic only. Route piping to avoid plants, ground cover, and structures.

B. Layout and stake locations of system components.

C. Review layout requirements with other affected work. Coordinate locations of sleeves under paving to accommodate system.

### 3.3 INSTALLATION

A. Trench Size:

1. Minimum width: 6 inches.
2. Minimum cover over mainline piping: 18 inches.
3. Minimum cover over lateral line piping: 12 inches.
4. Minimum cover over drip distribution tubing: 12 inches.

B. Trench to accommodate grade changes and slope to drains.

C. Maintain trenches free of debris, material, or obstructions that may damage pipe.

D. Install pipe, valves, controls, and outlets in accordance with manufacturer's instructions.

E. Connect to utilities, in accordance with state and local codes.

F. Set outlets and box covers at finish grade elevations.

G. Provide for thermal movement of components in system.

H. Slope piping for self-drainage to gravel filled well point.

I. Use flexible PVC connections with solvent welded fittings or O-ring type swing joint assemblies to each outlet. Unless specified otherwise, no other types of flexible connections will be allowed without the written approval of the Landscape Architect. Refer to detail sheet.

J. After piping is installed, but before heads or drip tubing is installed and backfilling commences, open

valves and flush system with full head of water.

K. Provide clean backfill material, free from debris over 1” size.

L. Backfill trench and compact to specified sub-grade elevation. Protect piping from displacement.

## 3.4 FIELD QUALITY CONTROL

A. Field inspection and testing will be performed under provisions of Division 01.

B. Prior to backfilling, test system for leakage at main piping to maintain 100 psi pressure for one hour.

C. System is acceptable if no leakage or loss of pressure occurs and system self-drains during test period.

## 3.5 ADJUSTING

A. Adjust control system to achieve time cycles required.

B. Adjust head types for full water coverage as directed.

## 3.6 DEMONSTRATION

A. Instruct Owner’s personnel in operation and maintenance of system, including adjusting of sprinkler heads. Use operation and maintenance material as basis for demonstration.

**END OF SECTION**

# SECTION 32 91 13

# SOIL PREPARATION

## PART 1 – GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.

B. Should this Section specify requirements in conflict with the Construction Drawings package, Construction Drawings package shall govern.

### 1.2 SUMMARY

A. Section includes preparation of soil.

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Work Specified in this Section: Installation of any landscape material.
2. Related Work Specified in other sections:

    a. Irrigation – Section 32 84 00
    b. Turf and Grasses – Section 32 92 00
    c. Planting – Section 32 93 00
    d. Transplanting – Section 32 96 00

### 1.3 PRE-INSTALLATION MEETING

A. Coordinate conference time and location with County representative.

### 1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples:

1. Soil: Samples of soil with test results for approvals.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Fertilizer shall be delivered to the site, mixed as specified, in the original unopened standard size bags showing weight, analysis and name of manufacturer. Containers shall bear the manufacturer's guaranteed statement of analysis, or a manufacturer's certificate of compliance covering analysis shall be furnished to the Landscape Architect and County's Landscape Inspector. Store fertilizer in a waterproof place and in such a manner that it will be kept dry, and its effectiveness will not be impaired.

B. Planting soil shall be delivered to the site in a clean loose and friable condition.

# PART 2 – PRODUCTS

## 2.1 MATERIALS

A. Soil:

1. REFERENCE SECTION 32 93 00 – PLANTING

B. Fertilizer:

1. REFERENCE SECTION 32 93 00 – PLANTING

## PART 3 – EXECUTION

### 3.1 PREPARATION

A. All planting beds shall be free of all rocks 1/2" or larger, sticks, and objectionable material including weeds, weed seeds. All lime rock shall be removed / cleaned down to the native soils.

B. Site preparation shall include the eradication and removal of any weeds, grass, clean-up of any dead material and finish grading as per the specs.

C. For sod preparation wet surface to a uniform depth of 2"-3" or until upper surface is reasonably wet and flat to avoid difference in height between sod pads.

D. This soil shall be tilled into the existing soil after the existing soil has been cleaned of all rocks, limestone, and sticks. Recycled compost is encouraged as a soil amendment alternative.

E. Sodded-lawn areas: 2" depth planting soil spread in place – throughout.

F. Shrub, hedge, and groundcover planting areas: 6" depth planting soil spread in place - throughout.

G. Trees, palms, specimen plant material: planting soil is required around the root ball of all trees and palms. 24" depth planting soil spread in place -or- to the depth of the root ball or container, whichever is greatest, throughout.

H. Landscape contractor shall loosen compacted soils in planting areas to provide for proper soil aeration for plant establishment.

I. Soils showing a high (alkaline) PH (over 7.5) shall be removed and replaced with native soil having a ph range of 6-7

J. Fertilizer: Apply fertilizer uniformly at manufacturer's recommended rate 2 days after sodding. Ensure that fertilizer is watered in well. Ensure that fertilizer does not seep into adjacent water body

K. Dust control measures to minimize wind erosion and dust nuisance situations shall include periodic wetting of exposed soil.

L. Where soil material is required to be compacted to a percentage of maximum density, the maximum density at optimum moisture content will be determined in accordance with ASTM D 1557. Where cohesion less, free draining soil material is required to be compacted to a percentage of relative density, the calculation of relative density will be determined in accordance with ASTM D 4253 and D 4254. Field density in-place tests will be performed in accordance with ASTM D 1556, ASTM D 2922, or by such other means acceptable to the Owner or Landscape Architect

**END OF SECTION**

# SECTION 32 91 19

# LANDSCAPE GRADING

## PART 1 GENERAL

### 1.0 RELATED DOCUMENTS

A. The PROCUREMENT AND CONTRACTING REQUIREMENTS, and applicable parts of DIVISION 01 - GENERAL REQUIREMENTS, as listed in the Table of Contents, shall be included in and made a part of this Section.

### 1.1 WORK INCLUDED

A. The work includes furnishing all labor, materials, equipment, and supervision to complete the site grading work in accordance with the Drawings and Specifications.

### 1.2 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 01 40 00, QUALITY REQUIREMENTS; Topsoil and other planting materials testing.
2. Section 31 20 00, EARTH MOVING; Excavation, backfill; establishment of subgrade elevations.
3. Section 32 84 00, IRRIGATION.
4. Section 32 92 00, TURF AND GRASSES.
5. Section 32 93 00, PLANTING.

## 1.3 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. American Society for Testing and Materials (ASTM):

| | |
|---|---|
| D 698 | Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft$^3$ (6000kN-m/m$^3$)) |
| D 1556 | Density of Soil in Place by the Sand-Cone Method |
| D 2167 | Density and Unit Weight of Soil In Place by the Rubber- Balloon Method |

## 1.4 EXISTING CONDITIONS

A. By submitting a bid, the Contractor affirms that he has carefully examined the site and all conditions affecting work under this Section. No claim for additional costs will be allowed because of lack of full knowledge of existing conditions.

## 1.5 QUALITY CONTROL

A. The Landscape Architect reserves the right to perform on-site observation during the grading operations. The observations may include, but not be limited to the following:

1. Observation of subgrade preparation for slab-on-grade and paved areas.
2. Observation of rough and finish grading operations.

B. All grade breaks shall be staked with grade stakes at each end, any change of direction, and at 20’ centers along the length for Landscape Architect’s review during grading operations.

C. Stake out and indicate finish grades at all spot elevations, 20 ft. intervals (minimum) along radial path, and in a 20 ft. x 20 ft. grid for the playground for Landscape Architect’s review and approval during grading operations.

D. Stake out all grades along retaining walls on 20’ centers for Landscape Architect’s review during grading operations.

E. Stake low points and high points in proposed dune and/or rain gardens for Landscape Architect and Civil Engineer’s review during grading operations.

F. Perform field density tests in accordance with ASTM D 1556 or ASTM D 2167.

1. Make at least one field density test of the subgrade for every 2000 sq. ft. of paved area, but in no case less than three tests.
2. In each compacted fill layer, make one field density test for every 2000 sq. ft. of overlaying paved area, but in no case less than three tests.
3. Make at least one field density test of the planting soil for every 2000 sq. ft. of plant bed area, but in no case less than three tests.
4. Make at least one field density test of the planting soil for every 2000 sq. ft. of lawn area, but in no case less than three tests.

G. If, in the opinion of the Architect, based on reports of the testing service and inspection, the subgrade or fills which have been placed are below the specified density, additional compaction and testing will be required until satisfactory results are obtained.

1. The results of density tests of soil-in-place will be considered satisfactory if the average of any four consecutive density tests which may be selected are in each instance equal to or greater than the specified density, and if not more than one density test out of five has a value more than 2% below the required density.

H. Grading must be approved by Landscape Architect and Civil Engineer prior to planting, mulching or any other required surface finishing.

## 1.6 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

A. The work shall be executed in such manner as to prevent any damage to adjacent property and any other property and existing improvements such as, but not limited to: streets, curbs, paving, utility lines and structures, monuments, bench marks and other public and private property.

B. In case of any damage or injury caused in the performance of the grading work, the Contractor shall, at his own expense, make good such damage or injury to the satisfaction of, and without cost to the Owner. Existing roads, sidewalks, and curbs damaged during the grading work shall be repaired or replaced to their original condition at the completion of operations. The Contractor shall replace, at his own cost, existing benchmarks, monuments, and other reference points which are disturbed or destroyed.

## 1.7 COORDINATION

A. Prior to start of grading operations, the Contractor shall arrange an on-site meeting with the Architect for the purpose of establishing Contractor's schedule of operations and scheduling inspection procedures and requirements.

B. As construction proceeds, the Contractor shall be responsible for notifying the Landscape Architect prior to start of grading operations requiring inspection and/or testing.

C. Soil materials to be graded shall be tested, furnished and placed under work of Section 312000, EARTH MOVING for fill materials, and Section 32 92 00, LAWNS AND GRASSES and Section 32 93 00, PLANTING for Planting Soil..

# PART 2 - PRODUCTS

## 2.1 SOURCE OF MATERIALS

A. Material shall be obtained from required on-site excavation, to the extent that suitable material is available, and from off-site sources to the extent that suitable material is not available from on-site excavation. Refer to Section 31 20 00, EARTH MOVING for fill materials, and Section 32 92 00, LAWNS AND GRASSES and Section 32 93 00, PLANTING for Planting Soil.

## PART 3 - EXECUTION

### 3.1 GRADING - GENERAL

A. Refer to Section 312000, EARTH MOVING for required levels of subgrade compaction at paved areas.

1. Unless otherwise indicated, scarified subgrade in landscape areas shall be compacted to 86% - 88% compaction ASTM D698 Standard Proctor.
2. Planting Soil – Planting Pits and Beds: shall be spread in lifts not greater than twelve inches and compacted to a density between 82 and 86 percent Standard Proctor Maximum Dry Density.
3. Planting Soil - Lawn Areas: shall be spread over the area and shall be compressed to a density of 86 to 88% Standard Proctor maximum dry density.

### 3.2 ROUGH GRADING

A. General: Rough grading shall include the shaping, trimming, rolling and refinishing of all surfaces of the subbase, shoulders, earth embankments and the preparation of grades as shown on the Drawings. The grade of shoulders and sloped areas may be done by machine methods.

B. Do all cutting, filling and grading to lines and grades indicated on the Drawings. Grade evenly to within the dimensions required for grades shown on the Drawings and specified herein. No stones larger than 4 in. shall be placed in upper 6 in. of fill. Fill shall be left in compacted state at the end of work day and sloped to drain.

1. Architect may make such adjustments in grades and alignments as are found necessary to avoid special conditions encountered.
2. Provide a smooth transition between adjacent existing grades and new grades.
3. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

C. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:

1. Lawn or Unpaved Areas: Plus or minus 1 inch (25 mm).
2. Walks and Pavements: Plus or minus 3/8 inch (9.5 mm).
3. Up to 2 in. in 10 ft. – 0 in. tolerance shall be permitted on slopes provided the slopes are uniform in appearance and without any abrupt changes.
4. Traffic of men and equipment across soil subgrade areas shall be prohibited following excavation to the required lines and grades.

## 3.3 FINE GRADING

A. Fine Grading: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

B. Finish Grading:

1. Lawn or Unpaved Areas: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch (13 mm) of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit finish grading to areas that can be planted in the immediate future.
2. Walks: Shape the surface of areas under walks to line, grade, and cross-section, with the finish surface not more than 0.00 ft. above or 0.10 ft. below the required subgrade elevation, compacted as specified, and graded to prevent ponding of water after rains.
3. Pavements: Shape the surface of the areas under pavement to line, grade and cross- section, with the finish surface not more than 1/2 in. above or below the required subgrade elevation, compacted as specified, and graded to prevent ponding of water after rains. Include such operations as plowing, discing, and any moisture or aerating required to provide the optimum moisture content for compaction. Fill low areas resulting from removal of unsatisfactory soil materials, obstructions, and other deleterious materials, using satisfactory soil material. Shape to line, grade, and cross- section as shown on the Drawings.

## 3.4 MAINTENANCE

A. Protect newly graded areas from traffic and erosion. Keep free of trash and debris.

B. Repair and re-establish grades in settled, eroded, and rutted areas to the specified tolerances.

C. Where completed compacted areas are disturbed by subsequent construction operations or adverse weather, scarify the surface, re-shape, and compact to the required density prior to further construction.

## 3.5 DISPOSAL OF EXCESS AND WASTE MATERIALS

A. Remove waste materials, including excavated material classified as unsatisfactory soil material, trash, and debris, and dispose of it legally off the Owner's property.

**END OF SECTION**

# SECTION 32 92 00

# TURF AND GRASSES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.

B. Should this Section specify requirements in conflict with the Construction Drawings package, Construction Drawings package shall govern.

### 1.2 SUMMARY

A. Section Includes:

1. Seeding.
2. Sodding.

### 1.3 WORK INCLUDED

A. Provide all materials and equipment, and do all work required to complete the sodding of lawn areas, including furnishing, and placing planting soil, as indicated on the Drawings and as specified.

B. Extent of sod areas will be reviewed and approved by Architect and Owner prior to commencement of Work of this Section.

### 1.4 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:

1. Section 31 20 00, EARTH MOVING; Establishment of subgrade elevation.
2. Section 32 84 00, PLANTING IRRIGATION
3. Section 32 91 19, LANDSCAPE GRADING.
4. Section 32 93 00, PLANTING; New plantings and related planting soil mixes.

### 1.5 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirements shall govern.

1. American Society for Testing and Materials (ASTM):

| | |
|---|---|
| C 136 | Sieve Analysis of Fine and Coarse Aggregates |
| D 422 | Particle-Size Analysis of Soils |
| E 11 | Wire-Cloth Sieves for Testing Purposes |

## 1.6 DEFINITIONS

A. Finish Grade: Elevation of finished surfaces.
B. Subgrade: Surface or elevation of subgrade soil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil
C. Topsoil: Soil that is present at the top layer of the existing soil profile at the Project site. This shall be considered the Topsoil component of Planting Soil mixes.
D. Imported Topsoil: Topsoil (loam) that contains a combination of particles typically almost equal in parts sand, silt and clay and including organic matter obtained from off-site sources.
E. Planting Soil: Unless otherwise indicated throughout this Section, the term “Planting Soil” shall apply to approved topsoil combined with sand and Florid peat, modified with soil amendments to meet the specific Planting Soil mix recommendations submitted by the testing laboratory.
F. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. This includes insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. It also includes substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
G. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

## 1.7 INFORMATION SUBMITTALS

A. Certification of grass seed.
   1. Certification of each seed mixture for turfgrass sod

B. Product certificates.

| Material | Quantity (lb.) |
|---|---|
| Fertilizer | 10 |
| Lime | 10 |
| Compost | 10 |

## 1.8 QUALITY ASSURANCE

A. Installer Qualifications: A qualified landscape Installer whose work has resulted in successful establishment of plants. Installer shall provide evidence of the following credentials:

   1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
   2. Experience: Five years' experience in landscape installation.
   3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.

## 1.9 CONTRACTOR'S INSPECTION AND TESTING

A. The Contractor shall engage an independent testing agency, experienced in the testing of agricultural soils and acceptable to the Architect, to perform the topsoil/planting soil tests and analyses specified herein. All costs associated with testing shall be the Contractor's responsibility.

1. Particle size analyis shall include the following gradient of mineral content:

| USDA Designation | Size in mm |
|---|---|
| Gravel | + 2 mm |
| Very coarse sand | 1-2 mm |
| Coarse sand | 0.5-1 mm |
| Medium sand | 0.25-0.5 mm |
| Fine sand | 0.1-0.25 mm |
| Very fine sand | 0.05-0.1 mm |
| Silt | 0.002-0.05 mm |
| Clay | < 0.002 mm |

2. Chemical analysis shall include the following:
   a. pH and buffer pH
   b. percentage of organic content by oven-dried weight
   c. Nutrient levels by parts per million, including phosphorus, potassium, magnesium, manganese, iron, zinc, and calcium. Nutrient test shall include testing laboratory recommendations for supplemental additions to the soil, if necessary, based on the requirements for ornamental horticultural plants. Recommendations shall include rates at which additives are to be applied.
   d. Soluble salt by electrical conductivity of a 1:2 soil/water sample.

## 1.10 DELIVERY. STORAGE, AND HANDLING

B. Digging Sod:
   1. Sod shall not be dug at the nursery or approved source until ready to transport sod to the site of the work or acceptable storage location.
   2. Before stripping, sod shall be mowed at a uniform height of 2 in.
   3. Cut sod to specified thickness and to standard width and length desired.

C. Transportation of Sod:
   1. Sod transported to the Project in open vehicles shall be covered with tarpaulins or other suitable covers securely fastened to the body of the vehicle to prevent injury. Closed vehicles shall be adequately ventilated to prevent overheating of the sod.
   2. Evidence of inadequate protection following the digging, carelessness while in transit, or improper handling shall be cause for rejection.
   3. Sod shall be kept moist, fresh, and protected at all times. Such protection shall encompass the entire period during which the sod is in transit, being handled, or are in temporary storage.
   4. Upon arrival at the temporary storage location or the site of the work, sod material shall be inspected for proper shipping procedures. Should the sod be dried out, the Architect will reject the sod. When sod has been rejected, the Contractor shall at once remove it from the area of the work and replace it with acceptable material.
   5. Unless otherwise authorized by the Architect, the Contractor shall notify the Architect at least two working days in advance of the anticipated delivery date of sod material. Certificate of Inspection when required shall accompany each shipment.

D. Handling and Storage of Sod:

1. Sod material shall be handled with extreme care to avoid breaking or tearing strips.
2. Sod shall not be stored for longer than 30 hours prior to installation. Sod shall be stored in a compact group and shall be kept moist.
3. Sod that has been damaged by poor handling or improper storage will be rejected by the Architect.

E. Deliver fertilizer in sealed waterproof bags, printed with manufacturer's name, weight, and guaranteed analysis.

## 1.11 PLANTING SEASON

A. Planting shall only be performed when weather and soil conditions are suitable for planting the material specified, in accordance with locally accepted practice, approval of the Architect, and to maintain the Contractor's guarantee.

B. Contractor shall provide schedule for conducting planting operations for review and approval by Owner.

## 1.12 ACCEPTANCE

A. Acceptance:

1. The Architect will inspect all work for Substantial Completion upon written request of the Contractor. The request shall be received at least ten calendar days before the anticipated date of inspection.
2. Acceptance of material by the Architect will be for general conformance to specified requirements and shall not relieve the Contractor of responsibility for full conformance to the Contract Documents.
3. Upon completion and reinspection of all repairs or renewals necessary in the judgement of the Architect, the Architect will recommend to the Owner that the work of this Section be accepted.

B. Sod areas will be accepted when in compliance with all the following conditions:

1. Roots are thoroughly knit to the soil.
2. Absence of visible joints.
3. All areas show a uniform stand of specified grass in healthy condition.
4. At least 60 days have elapsed since the completion of work under this Section.

## 1.13 MAINTENANCE

A. Contractor shall maintain plant material until the completion of guarantee period and Final Acceptance of work, as described in Paragraph 3.7 of this Section.

## 1.14 GUARANTEE

A. Lawns shall be guaranteed for a period of one year after the date of Acceptance by the Owner.

## 1.15 FINAL INSPECTION AND ACCEPTANCE

B. At the end of the guarantee period, the Architect and Owner will, upon written notice of end of guarantee period inspect the work for Final Acceptance. Request shall be received at least ten calendar days before the anticipated date for Final Inspection.

C. Upon completion and reinspection of full repairs or replacements necessary in the judgment of the Architect at that time, the Architect will recommend to the Owner that Final Acceptance of the Work of this Section be given.

# PART 2 PRODUCTS

## 2.1 SOD

A. Certified Turfgrass Sod: Superior sod grown from certified, high quality seed of known origin or from plantings of certified grass seedlings or stolons. It shall be inspected by the certification agency of the state in which it is grown to assure satisfactory genetic identity and purity, overall high quality, and freedom from noxious weeds as well as excessive quantities of other crop and weedy plants at time of harvest. All seed or original plant material in mixture must be certified. Turfgrass sod shall meet the published state standards for certification.

1. Sod shall be St. Augustine, conforming to FDOT Standard Specifications Section 981.

B. Sod shall be nursery grown on cultivated mineral agricultural soils. Sod shall have been mowed regularly and carefully, and otherwise maintained from planting to harvest.

C. Thickness of Cut: Sod shall be machine cut at a uniform soil thickness of 5/8 in., plus or minus 1/4 in., at the time of cutting. Measurement for thickness shall exclude top growth and thatch.

D. Strip Size: Individual pieces of sod shall be cut to the supplier's standard width and length. Maximum allowable deviation from standard widths and lengths shall be plus or minus 1/2 in. on width, and plus or minus 5% on length. Broken strips and torn and uneven ends will not be acceptable.

1. Strength of Sod Strips: Standard size sections of sod shall be strong enough to support their own weight and retain their size and shape if suspended vertically when grasped in the upper 10% of the section.

E. Big Roll Sod (Optional if approved by Owner): Big roll sod shall be 42 inches wide and normally 116 feet long, containing 405 SF or 45 SY Broken strips and torn, and uneven ends will not be acceptable.

F. Moisture Content: Sod shall not be harvested or transplanted when moisture content (excessively dry or wet) may adversely affect its survival.

G. Time Limitations: Sod shall be harvested, delivered, and transplanted within a 36-hour period unless a suitable preservation method is approved prior to delivery. Sod not transplanted within this period shall be inspected and approved by the Architect prior to its installation.

H. Thatch: Sod shall be relatively free of thatch. A maximum of 1/2 in. (uncompressed) thatch will be permitted.

I. Diseases, Nematodes, and Insects: Sod shall be free of diseases, nematodes, and soil- borne insects. State Nursery and Plant Materials Laws require that all sod be inspected and approved for sale. The inspection and approval must be made by the State Agricultural Department, Office of the State Entomologist.

J. Weeds: Sod shall be free of objectionable grassy and broad leaf weeds. Turfgrass sod shall be considered free of such weeds if less than five such plants are found per 100 sq. ft. of area.

1. Turfgrass sod shall not be acceptable if it contains any of the following weeds: common bermudagrass (wiregrass), quackgrass, johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel and bromegrass.

## 2.2 SOD FARM GROWING MEDIUM

A. Soil in which sod was grown shall be classified as loam or sandy loam (silt loam is not acceptable)
1. The maximum retained on the #10 sieve shall be 15% by weight of the total sample.
2. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422.
3. The organic content shall be between 3.0 and 8.0 percent.

## 2.3 PLANTING SOIL

A. Existing Topsoil

1. Existing topsoil from on-site source(s) shall be used for planting soil and amended to meet the requirements of this Section for planting soil.

B. Planting Soil
1.

1. Planting soil shall be composed of on-site topsoil with additives, if required, to achieve particle distribution and organic content specifications. Topsoil shall be free of subsoil, large stones, earth clods, sticks, stumps, clay lumps, roots, other objectionable, extraneous matter or debris nor contain toxic substances.
2. Planting soil shall have a pH value between 5.5 and 6.5 and organic matter content of 5 to 10% of total dry weight.
3. Planting soil shall have the following mechanical analysis (see paragraph 1.7 for particle sizes):

| Approximate Particle Distribution | |
|---|---|
| Gravel | Less than 10% |
| Coarse to medium sand | 55 – 65% |
| Fine to very fine sand | 15 – 25% |
| Silt | 10– 20% |
| Clay | 15 – 20% |

4. Minimum planting soil nutrient levels shall be: Nitrogen @ 5% average of organic matter, Phosphorus @ .02 to .05% average of total soil content, Potassium @ 1.2% average of total soil content.
5. The Contractor shall provide the Owner with planting soil test results, as specified in Paragraph 1.7, before the start of planting operations. If planting soil does not fall within the required particle distribution, organic content, or pH range, it shall be adjusted to meet the specifications through the addition of sand, compost, limestone, or aluminum sulfate to bring

it within the specified limits.

## 2.4 COMPOST

A. Compost shall be derived from organic wastes such as food and agricultural residues, animal manures, mixed solid waste and biosolids (treated sewage sludge) that meet all State Environmental Agency requirements. The product shall be well composted, free of viable weed seeds and contain material of a generally humus nature capable of sustaining growth of vegetation, with no materials toxic to plant growth.

1. Compost shall have the following properties: Parameters Range

| | |
|---|---|
| pH | 5.5 – 8.0 |
| Moisture Content | 35% - 55% |
| Soluble Salts | ≤ 4.0 mmhos (dS) |
| C:N ratio | 15 – 30:1 |
| Particle Size | < 1” |
| Organic Matter Content | > 50% |
| Bulk Density | < 1000 lbs./cubic yard |
| Foreign Matter | < 1% (dry weight) |

2. Compost generator shall also provide minimum available nitrogen and other macro and micronutrients to determine fertilizer requirements.
3. Guidelines for quantity of compost required to achieve suitable soil organic content in soil mixes for ornamental horticultural planting shall be as recommended by the compost manufacturer.

B. Composted pine bark shall be used for amending on-site soil.

## 2.5 WATER

A. Water shall be suitable for irrigation and free from ingredients harmful to sodded areas.

## 2.6 COMMERCIAL FERTILIZER

A. Starter Fertilizer shall be Polyon Fertilizer, 18-0-20, manufactured by Harrell’s LLC, 720 Kraft Road, Lakeland, FL 33815’ tel. 863-687-2774.

B. Fertilizer shall conform to the following:

1. When applied as a topsoil amendment, fertilizer shall have an analysis that will deliver appropriate amounts of nitrogen, phosphorus, and potassium as required to remedy deficiencies revealed by testing the topsoil.
a. 50% of nitrogen shall be derived from natural organic source of ureaform.
b. Available phosphorus shall be derived from superphosphate, bone meal, or tankage.
c. Potassium shall be derived from muriate of potash containing 60% potash.

C. Fertilizer shall be delivered in manufacturer's standard container printed with manufacturer's name, material weight, and guaranteed analysis.

D. Fertilizers with N-P-K analysis other than that stated above may be used provided that the application rate per square foot of nitrogen, phosphorus, and potassium is equal to that specified.

## 2.7 WEED CONTROL

A. Weed control for stockpiled topsoil shall be a non-selective weed killer for control of grassy and broadleaf weeds; weed control shall have short residual, allowing sodding operations to occur within 7 days of application.

## PART 3 EXECUTION

### 3.1 PREPARATION OF SUBGRADE

A. Subgrade shall be examined to ensure that rough grading and all other subsurface work in lawn areas and other areas to be sodded is done prior to start of sodding.

B. Existing subgrade shall be loosened or scarified to a minimum depth of 3 in. prior to spreading topsoil. Subgrade shall be brought to true and uniform grade, and shall be cleared of stones greater than 3 in., sticks, and other extraneous material.

### 3.2 SPREADING OF PLANTING SOIL

A. Planting soil shall not be spread until it is possible to follow immediately or within 24 hours with sodding operations. If topsoil is spread prior to this time it shall be cultivated to loosen soil prior to sodding.

B. Planting soil shall not be placed when subgrade or topsoil material are frozen, excessively wet, or excessively dry.

C. Planting soil shall be spread in a uniform layer, to a thickness which will compact to the depth required to bring final lawn and grass surfaces to required elevation. Unless otherwise indicated minimum depth of topsoil for sodded areas shall be 6 in.

1. Place approximately 1/2 the thickness of planting soil mixture required. Work into top of loosened subgrade to create a transition layer and then place remainder of planting soil mixture.

D. Grade lawn and grass areas to a smooth, even surface with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future. Remove trash, debris, stones larger than 1-1/2 inches (38 mm) in any dimension, and other objects that may interfere with planting or maintenance operations.

E. Moisten prepared lawn areas before planting when soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.

F. Restore prepared areas if eroded or otherwise disturbed after fine grading and before planting.

### 3.3 APPLICATION OF FERTILIZER AND CONDITIONERS

A. Fertilizer shall only be applied during growing season: March through October.

B. Fertilizer and conditioners shall be applied in accordance with manufacturer’s printed instructions and at the following rates:

1. Compost - as required by test results of topsoil.
2. Fertilizer - as required by test results of topsoil.

C. Mixing with planting soil:

1. Fertilizer and conditioners shall be spread over the entire lawn areas at the application rates indicated above.
2. Materials shall be uniformly and thoroughly mixed into the top 4 in. of planting soil by discing, rototilling, or other approved method.

## 3.4 FINISH GRADING

A. Contractor shall set grade lines for Architect's review and approval.

1. Final surface of topsoil immediately before sodding shall be within ± 1/2 in. of required elevation, with no ruts, mounds, ridges, or other faults, and no pockets or low spots in which water can collect. Stones, roots, and other debris greater than 1 in. in any dimension, which are visible at the surface, shall be removed and the resulting holes filled with topsoil, leaving a uniform planar surface. Refer to Section 329119, LANDSCAPE GRADING.

B. Finish grade surface with a drag or rake. Round out all breaks in grade, smooth down all lumps and ridges, fill in all holes and crevices. Rolling with a light roller is acceptable, if the surface is scarified afterward.

1. Lawn: Compaction of topsoil for finish grade shall be 85% to 88%.

C. In the event of settlement, the Contractor shall readjust the work to required finished grade.

## 3.5 SODDING

A. Edges of the sodded areas shall be smooth, and all sodded areas shall conform to the design cross sections and grade. At edges adjacent to curbs, paved areas, etc., top surface of earth in sod shall be 1/2 in. below adjacent hard surface.

B. Sod shall be placed, and all sodding operations completed within 72 hours following stripping from sod source bed.

C. On slopes steeper than 2 to 1, sod shall be fastened in place with suitable wood pins or other approved methods, spaced at not less than 1 pin per square foot.

D. Surface of completed sodded area shall be smooth. Sod shall be laid edge-to-edge, with tight-butted, staggered joints. Sod shall be carefully placed to ensure that it is neither stretched or overlapped. Immediately after laying sod shall be pressed firmly into contact with sod bed by tamping or rolling, to eliminate air pockets. Following compaction, topsoil shall be used to fill all cracks, and excess soil shall be worked into grass with rakes or other suitable equipment. Sod shall not be smothered with excess fill soil.

E. Immediately after sodding operations have been completed, entire surface shall be compacted with a cultipacker roller or other approved equipment weighing 100 to 160 lb./ft. of roller.

F. Completed sod shall immediately be watered sufficiently to uniformly wet the soil to at least 1 in. below the bottom of sod bed.

## 3.6 CONTRACTOR MAINTENANCE

A. Except as otherwise specified below, maintenance shall include all operations required to produce an established lawn, including but not limited to:

Fertilizing
Mowing
Replanting
Watering
Weeding

B. Maintenance of sodded areas shall begin upon completion of sodding and shall continue until the completion of guarantee period and Final Acceptance of work.

1. Watering
    a. Week No. 1: Provide all watering necessary for rooting of sod. Soil on sod pads shall be always kept moist. Continue to water to a depth of 6 inches daily for the first month after installation. Watering shall be done during the heat of the day to prevent wilting.
    b. Week No. 2 and Subsequent Weeks: Water as necessary to maintain adequate moisture in the upper 6 in. of soil to promote deep root growth.
2. Mowing
    a. Mowing shall not be attempted until the sod is firmly rooted and securely in place. Not more than 1/3 of the grass leaf shall be removed during the first or subsequent mowing.
    b. Grasses shall be maintained between (1 in. and 2 in. height: Bermuda Grass) (2- 1/2 and 3-1/2 in. height; Bahia Grass), unless otherwise directed by the Owner.
    c. All clippings shall be removed.
    d. After 2 mowing, the Contractor shall apply a high nitrogen fertilizer once a month at the rate of 1 pound of actual nitrogen per 1000 square feet.

C. Sodded areas which fail to show a uniform stand of grass shall be replanted as often as necessary to establish an acceptable stand of grass.

    a. Scattered bare spots, shall not exceed 15 sq. in. each.

D. Weeds and growth other than varieties of grass named in turf sod formula shall be removed. Removal may be accomplished by use of suitable herbicides or by physical removal, in which case top growth and roots shall both be removed, and bare spots exceeding specified limits shall be resodded.

E. Remove rope barricades only after second cutting of lawns.

**END OF SECTION**

# SECTION 32 93 00

# PLANTING

## PART 1 – GENERAL

### 1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.

B. Should this Section specify requirements in conflict with the Construction Drawings package, Construction Drawings package shall govern.

### 1.2 SUMMARY

A. Furnish all labor, material equipment and services necessary to provide all landscape planting, complete in place, as shown and specified. This Section includes the following:

1. Trees and Palms
2. Shrubs and groundcovers
3. Soils
4. Mulches
5. Stakes and guys
6. Landscape edgings

B. Related Sections: The following Sections contain requirements that relate to this Section:

1. Work Specified in this Section: Installation of any landscape material.
2. Related Work Specified in other sections:

    a. Irrigation – Section 32 84 00
    b. Turf and Grasses – Section 32 92 00
    c. Soil Preparation – Section 32 91 13

### 1.3 SCOPE

A. Provide all materials, labor, equipment, and services required for the execution of all planting and related work as shown on the drawings and noted herein.

B. Refer to notes on LP series sheets on the drawings.

### 1.4 APPLICABLE STANDARDS

A. ANSI Z60.1 "American Standard for Nursery Stock."

B. “Florida Grades and Standards for Nursery Plants”

## 1.5 SUBMITTALS

A. General: Submit each item in this Article according to the Conditions of the Contract and Specification Sections.

B. Product certificates signed by manufacturers certifying that their products comply with specified requirements.

1. Manufacturer's certified analysis for standard products.
2. Analysis for other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
3. Label data substantiating that trees, shrubs, and planting materials comply with specified requirements.

C. Prior to initiating all work, provide the Landscape Architect with samples of each of the following:

1. 1 lb. of shredded hardwood or pine straw mulch, in a labeled plastic bag, if applicable.
2. 1 lb. of soil, in a labeled plastic bag. Label needs to come from the supplier and be attached to the bag.
3. Soil test report of the soil. (to accompany the soil sample). Submit soil test results listing pH, fertility levels, texture report (percentages of sand, silt, clay and organic matter) and maximum particle size. Include the option for recommended amendments for all testing types. Test report to be conducted within two (2) months of construction start date. Provide soils report with cover sheet.
4. 1 lb. of compost, in a labeled plastic bag. Label needs to come from the supplier and be attached to the bag.
5. 1 lb. of prepared planting bed soil mix, in a labeled plastic bag. Label needs to come from the supplier and be attached to the bag.
6. 1 lb. of Coquina shell mulch in a labeled plastic bag. Label needs to come from the supplier and be attached to the bag.

D. Tree and plant photos to be approved by Landscape Architect prior to procurement and delivery of plant material.

E. Planting schedule indicating anticipated dates of installation and locations for each type of planting.

F. Percolation tests on the subgrade in the excavated planting bed areas.

G. For field dug large trees: Provide anticipated root pruning and tree moving schedule including the anticipated length of time that the tree will remain in the field after root pruning and anticipated tree relocation time. Provide the anticipated root ball size for design coordination. Allow a minimum of 3 months after root pruning before relocating tree.

H. Qualifications of contractor and contractor's field supervision.

## 1.6 QUALITY ASSURANCE

A. Source Quality Control:

1. Submit documentation to Landscape Architect within fifteen (15) days after award of Contract that all plant material is available and has been purchased or reserved. Contractor shall be responsible for all material listed on plant list. Any and all substitutions due to unavailability must be requested in writing prior to confirmation of ordering. All materials shall be subject to inspection by Landscape Architect at any time after confirmation of ordering.
2. Plants shall be subject to inspection and approval of Owner and Landscape Architect at place of growth or upon delivery for conformity to specifications. Such approval shall not impair the right of inspection and rejection during progress of the work. Inspection and tagging of plant material by the Landscape Architect is for design intent only and does not constitute the Landscape Architect's approval of the plant materials with regards to their health and vigor as specified in Section 2. The health and vigor of the plant material is the sole responsibility of the Contractor.
3. Contractor shall submit photos of all selected plant material for review and approval by Owner and Landscape Architect. Photos shall be taken with a measurement stick or rod so that the height of the plant material can be reviewed. Photos shall also include the species, place of growth and quantity of plants. After the photo submission and approval, the Owner reserves the right to tag plant material at the selected nursery. Landscape Architect reserves the right to refuse inspection at this time, if in their judgment, a sufficient quantity of plants is not available for inspection.
4. The Contractor shall submit samples and/or specifications of any item being used on site upon the request of the Landscape Architect.

B. Installer Qualifications: Engage an experienced Installer with five years of experience who has completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishment.

1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the project site during times that landscaping is in progress.

C. Provide quality, size, genus, species, and variety of trees and shrubs indicated, complying with applicable requirements of "Florida Grades and Standards for Nursery Plants".

D. Measurements: Measure trees and shrubs with branches and trunks or canes in their normal position. Do not prune to obtain required sizes. Height measurement shall be taken from ground level for field grown stock and from the soil line for container grown stock, which should be at or near the top of the root flare. Tree measurements for nursery grown trees to be 48 inches above ground or soil line. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip-to-tip.

## 1.7 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original unopened containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery and while stored at site. The Contractor shall furnish the Landscape Architect with copies of all receipts for all materials and amendments specified in this section.

B. Tree root balls shall be irrigated just prior to shipping. Trees shall be secured in the truck so as not to roll. Do not allow closed trucks to remain standing in the sun in hot weather unless they are air-conditioned. B&B trees shall have their root balls shrink-wrapped prior to transporting them from the nursery.

C. Trees shall be shipped to the site in enclosed vans or covered with woven shade tarp.

D. The Contractor shall notify the Landscape Architect seven (7) days in advance of delivery of all plant materials and shall submit an itemized list of the plants in each delivery. Deliver all plants with legible identification labels stating proper botanical names and sizes indicated on plant list. Deliver trees, shrubs, ground covers, and plants after preparations for planting have been completed and install immediately. If planting is delayed more than 6 hours after delivery, set planting materials in shade, protect from weather and mechanical damage, and keep roots moist so that plants are maintained in a healthy, vigorous condition. Protect plant material during delivery to prevent damage to root balls, trunks or branches or desiccation of leaves.

1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
2. Do not remove container-grown stock from containers before time of planting.
3. Water root systems of trees and shrubs stored on site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

E. Trees and Shrubs: Deliver freshly dug trees and shrubs. Do not prune before delivery, except as approved by Landscape Architect. Protect bark, branches, and root systems from sunscald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy natural shape. Provide protective covering during delivery to prevent desiccation. Do not drop trees and shrubs during delivery. Plant materials that have been damaged in any way will be discarded and if installed, shall be replaced with undamaged materials at the Contractor's expense.

F. Tree delivery and installation shall be coordinated such that they are completed on the same day. Should planting be unavoidably delayed, contractor shall store trees in an upright manner, or a manner acceptable to the Landscape Architect.

G. Under no circumstances is plant material to be handled by stem or trunk. All trees are to be handled with flexible straps secured around rootball.

## 1.8 PROJECT CONDITIONS

A. Utilities: Determine location of above grade and underground utilities and perform work in a manner which will avoid damage. Contractor is responsible for any damage to utilities and Owner's property. Coordinate with all other site contractors. Hand excavate as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.

B. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Landscape Architect before planting.

C. Work continuously on the site with exception of bad weather delays until the project is completed. Maintain records of bad weather days and notify Landscape Architect as they occur.

D. Schedule: Install trees and shrub plant material before lawn installation has commenced. Contractor to coordinate work with all other trades as stated in General Conditions.

## 1.9 WARRANTY

A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.

B. Special Warranty: Warrant the following living planting materials for a period of one year after date of Substantial Completion, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner, abnormal weather conditions unusual for warranty period, or incidents that are beyond Contractor's control.

1. Trees.
2. Shrubs.

C. All plant material installed under the Contract shall be guaranteed to remain alive and in healthy vigorous condition for a period of one year after date of written Substantial Completion of project landscape installation. The cost of replacements is at the Contractor's expense. Material to be replaced with fifteen (15) days of written notice by Owner or Landscape Architect.

D. Warranty shall not include damage or loss of plants due to acts of God, acts of vandalism, or negligence on the part of the Owner, as determined by the Landscape Architect.

E. Remove and replace dead planting materials immediately unless required to plant in the succeeding planting season.

F. Replace planting materials that are more than 25 percent dead or in an unhealthy condition at end of warranty period. Replacements shall be in accordance with the drawings and specifications and shall be guaranteed as set forth in sections A and B above.

G. Contractor shall remove all staking, guying and wrapping materials at the end of the guarantee period.

## 1.10 TREE AND SHRUB MAINTENANCE

A. Maintain trees and shrubs by pruning, cultivating, watering, weeding, restoring mulch and retention basins, tightening, and repairing stakes and guy supports, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Contractor shall submit a list and manufacturer's product information for all chemicals to be used on site for Owner approve prior to any chemical applications. Restore or replace damaged tree wrappings. Maintain tree and shrubs for the following period.

1. Maintenance Period: Maintain 1 year after Final Acceptance for each phase of work completed.

# PART 2 - PRODUCTS

## 2.1 TREE AND SHRUB MATERIAL

A. General: Furnish nursery grown trees and shrubs conforming to ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement. Plants shall be in accordance with the Florida Department of Agriculture and Consumer Services regulations for nursery inspections, rules and rating. All plants shall have a normal habit of growth and shall be full, well branched, well-proportioned and symmetrical. Plants shall be sound, healthy, and vigorous. The Landscape Architect reserves the right to examine the roots of any plant material he determines questionable. Samples to be chosen randomly and shall be at the Contractor's expense.

B. Field-grown trees and palms shall be nursery-grown and hardened off (pre-dug) for a minimum of six (6) weeks prior to deliver to job site. Container grown trees shall be nursery grown.

C. Trees with included bark within major branch unions, root balls that have bound, circling, or girdled roots, or trees with synthetic burlap will not be accepted. The top of the first major root originating from the trunk must be within one inch of the top of the root ball. If the first root is deeper than this, the tree will be rejected.

D. Grade: Provide trees and shrubs of sizes and grades conforming to the "Florida Grades and Standards for Nursery Plants" for type of trees and shrubs specified. All trees to be Florida Grade #1 or better. Trees and shrubs of a larger size may be used if acceptable to Landscape Architect with a proportionate increase in size of roots or balls. The minimum acceptable size of the plants will correspond with that of normally expected for species and varieties of commercially available nursery stock or as specified in the plant list shown on the drawings. Plants larger in size than specified may be used with approval of the Landscape Architect, but the use of larger plants will make no change in the Contract price. If the use of larger plants is approved, the ball of earth or spread of roots for each plant will be increased proportionately. (Materials planted in masses shall be of a uniform size).

E. All plants not conforming to the requirements herein specified shall be considered defective and such plants whether in place or not, shall be rejected and immediately removed from the site and replaced with new plants at the Contractor's expense. The plants shall be of the species, variety, size and conditions specified herein or as shown on the drawings. Under no conditions will there be any substitutions of plants or sizes listed on the accompanying plans, except with the written consent of the Landscape Architect.

F. Pruning: At no time shall trees or plant materials be pruned, trimmed or topped prior to delivery and any alteration of their shape shall be conducted only with the approval, and when in the presence of, the Landscape Architect.

G. Plant material shall be true to botanical and common name and variety as specified on the drawing

## 2.2 SHADE TREES, ORNAMENTAL TREES, PALMS AND CYCADS

A. Shade Trees: Single-stem trees (unless otherwise noted on plans) with straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, conforming to the "Florida Grades and Standards for Nursery Plants" for type of trees required.

1. Branching Height: 1/3 to 1/2 of tree height.
2. Nursery Grown and Collected Stock:

    a. All material shall have been grown under climatic and soil conditions similar to those in locality of project.
    b. Container-grown stock in vigorous, healthy condition, not root-bound or with root system hardened off shall have grown in container from seedling and have been grown in container for a minimum of 8 months.
    c. Use only liner stock plant material which is well established in removable containers or formed homogeneous soil sections.
    d. All material shall be nursery grown unless otherwise called out on plans.
    e. No plants shall have flush cuts or open injuries
    f. Root Balls shall be appropriately sized.

3. All balled and burlapped trees shall have firm, natural root balls or sufficient size to encompass the fibrous and feeding root system necessary for full recovery and establishment of the plant. Cracked or soft or "mushroomed" rootballs will be unacceptable. Ball size shall conform to the latest edition of the Florida Grades and Standards for Nursery Plants. B&B materials shall be firmly wrapped with 100% organic burlap.
4. Florida #1: Trunk: Trunk may fork in the upper half of tree; Trunk bows less than 15°; Branching: All branches equally dominant; Branches are at least 4" apart; a single branch in the upper half of tree may be larger than 2/3 the diameter of the trunk; No branch tips are taller than the trunk. Structural Uniformity: Most branches are evenly distributed; Only one major branch located directed above another; Small voids may be present in foliage. Ref. the current edition of the "Florida Grades and Standards for Nursery Plants" for additional information.

B. Ornamental Trees: Small upright or spreading type, branched or pruned naturally according to species and type, and with relationship of caliper, height, and branching recommended by ANSI Z60.1, and stem form as follows:

1. Form: Multitrunk, with 3 – 5 canes.

C. Palms – Single Trunk, Pinnate or Palmate: Those pinnate (or palmate) -leaved palms which normally do not sucker.

1. Florida #1: A single grade deduction from the "Florida Grades and Standards for Nursery Plants"

D. Palms – Clustering: Those palm species which normally sucker from the base, forming larger and larger colonies with age. Includes both pinnate and palmate-leaved species.

1. Florida #1: A single grade deduction from the "Florida Grades and Standards for Nursery Plants"

E. Provide balled and burlapped trees and/or container grown trees as required on planting plans.

## 2.3 PLANTS

A. Provide plants established and well rooted in removable containers or integral peat pots and with not less than the minimum number and length of runners required by ANSI Z60.1 for the pot size indicated.

## 2.4 BACKFILL SOIL

A. Backfill soil shall meet the requirements of the local ordinance. Soil in sidewalk cut outs, parking lot islands, and other small spaces shall be replaced or amended to improve conditions.

B. Backfill to be reasonably free from clay lumps, coarse sands, stones, roots, and other foreign matter. There shall be no toxic amounts of acid or alkaline elements. Submit samples to Landscape Architect for approval.

C. All fill material seaward and straddling the Coastal Construction Control Line (CCCL) shall meet the specifications/criteria of subsection 62B-33.005(7), F.A.C. (FLORIDA ADMINISTRATIVE CODE)

Specified Material:
Beach Sand 'C' Ortona Mine
FDOT Mine #05-045

Manufacturer:
E.R. Jahna Industries, Inc.
8561 West SR 78
Moore Haven, FL 33471
Phone: (863) 528-2335

## 2.5 SAND

A. Sand for Planting Soil Mixes shall be uniformly graded medium to coarse sand consisting of clean, inert, rounded to sub-angular grains of quartz or other durable rock free from loam or clay, surface coatings and deleterious materials with the following graduation.

| | Percent Passing | |
|---|---|---|
| U.S. Sieve Size Number | Minimum | Maximum |
| 10 | 100 | -- |
| 18 | 65 | 85 |
| 35 | 35 | 50 |
| 60 | 15 | 28 |
| 140 | 4 | 10 |
| 270 | 0 | 5 |
| 0.002mm | 0 | 0.5 |

B. Maximum size shall be one-inch largest dimension. The maximum retained on the #10 sieve shall be 15% by weight of the total sample. The ratio of the particle size for 70% passing (D70) to the particle size for 20% passing (D20) shall be 3.0 or less. (D70/D20 <3.0) Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition.

C. pH: Shall be less than 7.2.

D. Refer to Backfill Soil conditions as noted on 2.4 item C.

## 2.6 COMPOST

B. Composted pine bark shall be supplied by Atlas Peat & Soil, Inc., 9621 State Road 7, Boynton Beach, FL 33472; Tel. 561 734 7300, or approved equal. Composted Pine Bark shall be used for amending on-site soil.

## 2.7 PEAT

C. Peat shall be Florida Peat, supplied by Atlas Peat & Soil, Inc., 9621 State Road 7, Boynton Beach, FL 33472; Tel. 561 734 7300, or approved equal. Florida Peat shall be used for amending on-site soil.

## 2.8 TOPSOIL (PEAT)

A. Existing Topsoil
   1. Existing topsoil from on-site source(s) may be used for planting soil, to the extent available, if it meets the requirements of this Section for planting soil, or if approved by the Architect.

B. Imported Topsoil

   1. Imported topsoil shall be a natural, fertile, friable soil typical of cultivated topsoil's of the locality, suitable for the germination of seeds and support of vegetative growth, with additives, if required, to achieve particle distribution and organic content specifications. Topsoil shall be taken from a well-drained, arable site, free of subsoil, large stones, earth clods, sticks, stumps, clay lumps, roots, other objectionable, extraneous matter or debris nor contain toxic substances.
   2. Mechanical analysis (see paragraph 1.7 for particle sizes):

| U.S. Sieve Size Number | Percent Passing By Dry Weight |
|---|---|
| ¼ in. | 90 - 92 |
| 10 | 50 - 55 |
| 40 | 20 - 25 |
| 100 | 4 - 6 |
| 200 | 0 - 1 |

C. Existing Topsoil

   1. Existing topsoil from on-site source(s) may be used for planting soil, to the extent available, if it meets the requirements of this Section for planting soil, or if approved by the Architect.

D. Imported Topsoil

   1. Imported topsoil shall be a natural, fertile, friable soil typical of cultivated topsoil's of the locality, suitable for the germination of seeds and support of vegetative growth, with additives, if required, to achieve particle distribution and organic content specifications . Topsoil shall be taken from a well-drained, arable site, free of subsoil, large stones, earth clods, sticks, stumps, clay lumps, roots, other objectionable, extraneous matter or debris nor contain toxic substances.

2. Mechanical analysis (see paragraph 1.7 for particle sizes):

| U.S. Sieve Size Number | Percent Passing By Dry Weight |
|---|---|
| ¼ in. | 90 - 92 |
| 10 | 50 - 55 |
| 40 | 20 - 25 |
| 100 | 4 - 6 |
| 200 | 0 - 1 |

## 2.9 PLANTING SOIL MIXES

A. Soil to be locally available and native to the region and shall meet the following specifications (Per the local ordinance):

1. Clean Sand as noted above
2. Topsoil/Peat as noted above
3. Shall be free of trash, weeds, deleterious materials, rocks and debris.
4. 100% shall pass through a ½" screen.
5. Soil to be loamy material that meets the requirements of USDA textural triangle.
6. Soil pH to be between the range of 6.5 – 7.5. Soils having high (alkaline) pH (over 7.5) shall be amended or replaced.

B. Prepared Planting Bed Mix:

A. Planting Soil for Palms:
90% Clean Sand
10% Topsoil/Florida Peat mixture

B. Planting Soil for Trees, Shrubs and Ground Covers:
70% Clean Sand
30% Topsoil/Florida Peat mixture

## 2.10 MULCHES

A. The mulch shall be free from deleterious materials and suitable as a top dressing of trees and shrubs; No cypress mulch, or artificially colored mulches may be installed.

B. Coquina Shell Mulch (at Oceanfront Plaza): shall be a mix of finely crushed coquina shells and sand (specified in Paragraph 2.3) to match Architect-approved sample. Coquina Shells shall be supplied by Yardco, 7729 Lawrence Road, Boynton, Beach, FL 33436; Pebble Junction, Inc. 702 South French Ave., Highway 17-92 - Sanford, FL 32771; Phone: 407- 323-3838; Toll Free: 800-541-8996; Fax: 407-323-5413; sales@pebblejunction.com, or other approved supplier and shall match Architect-approved sample.

## 2.11 FERTILIZER

A. Apply Osmocote® 12-8-8 Controlled Release Fertilizer (or approved equal) at label rate. Submit any request for substitution to Landscape Architect for Approval.

B. Tree Planting Pits: Apply Agriform 20-10-5 Plus Minors or similar approved slow-release tablets applied per manufacturer suggested application rate chart. Place plant in hole and backfill to halfway point. Add tablets, keeping 1-2 inches away from root tips. Finish filling hole.

## 2.12 PRE-EMERGENT HERBICIDE

A. Apply granular Chipco® Ron-Star®-G or approved equal at label rate.

## 2.13 STAKES AND GUYS

A. For Shade and Ornamental Trees: Wellington tape or approved equal connected to tree (above first lateral branches) with Sisal or Bio-degradable material knotted and secured to trunk. Rebar or Wooden Stakes buried below grade. Provide orange warning tape 12" above grade.

B. (3) 2"x4"x8" Wood Batten per Large Tree or Palm; Painted (Color to be determined), connected with steel bands.

C. Burlap Chafing Guard: Placed between trunk and Wood Batten to protect trunk from damage.

D. (3) 2x4 Pressure Treated Wood Brace per Tree or Palm; Painted (Color to be determined), toe nail to Batten. Do not nail into trunk.

## 2.14 WATER

A. Furnished by owner; transport as required.

B. Water shall be suitable for irrigation and shall be free from ingredients harmful to plant life.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Obtain Owner's certifications that rough grades to plus or minus 0.10' have been established prior to commencing planting operations. Provide for inclusion of all amendments, settling, etc. Landscape Contractor shall be responsible for shaping and fine grading all planting areas as indicated on plans or as directed by Landscape Architect.

B. Verify location of all utilities prior to pit excavation and grading. Contractor is responsible for any damage to utilities and Owner's property. Coordinate with all other site contractors.

C. Perform a percolation test on the subgrade at the bottom of the excavated planting beds. A one (1) inch percolation rate per hour is required prior to installation of planting bed mix. For example, if a planting bed is excavated at a twelve (12) inch depth, the bed should be filled with water, and after twelve hours, all the water should be gone. Testing should be performed in multiple locations on the site and submitted on a plan to be approved by the Landscape Architect. Contractor to notify the Landscape Architect prior to starting the test. The Landscape Architect may choose to visit the site at the beginning and at the conclusion of the testing. Contractor to submit a report on the results of the testing. If the specified percolation rate is not achieved, the Contractor will need to perform soil ripping.

D. Inspect trees and shrubs for inquiry, insect infestation, and trees and shrubs for improper pruning. Do not begin planting of trees until deficiencies are corrected or plants replaced.

E. Quantities shown on plans are for the convenience of the Contractor. In case of discrepancy between the plant list and the plans, the plans shall govern. The Contractor is also responsible for determining the quantities needed to complete the installation to the full extent dimensioned on the drawings.

### 3.2 PREPARATION

A. Layout of Major Plantings: Tree locations and outlines of planting beds shall be marked on the ground by the Contractor before any plant pits are dug. All such locations shall be approved by the Landscape Architect. Make minor adjustments as may be required.

B. Planting mix for all shrub beds as indicated on the plans and tree backfilling to consist of the prepared planting bed mix.

C. Contractor to provide 48 hours' notice to Landscape Architect prior to mixing of any soil on site for approval of mixed soil.

D. If soils are mixed off site, contractor shall submit location of pre-mix and mix analysis for Landscape Architect.

## 3.3 EXCAVATION FOR TREES AND SHRUBS

A. If underground construction or utility line is encountered in the excavation of planting areas, other location for planting may be selected by the Landscape Architect.

B. Pits and Trenches: Excavate with vertical sides and with bottom of excavation slightly raised at center to assist drainage. For all tree excavation, roughen glazed surface on sides and bottom of the excavation holes by use of hand tools.

1. Continuous planting beds for shrubs and groundcovers, depth of excavation:

    a. 16 inches below mulch layer for shrub materials
    b. 12 inches below mulch layer for groundcover materials

2. Trees and shrub pit dimensions

    a. Depth: Height of the rootball (vertical sides)
    b. Width: Two times (2x) the diameter of the rootball.

3. All excess soil excavated from beds to be hauled off and disposed of in a lawful manner offsite unless by written consent, the Landscape Architect directs the Contractor to supplement lawn area with approved excavated soil.
4. Contractor shall fracture and break rock or clay if encountered in excavation and perform a drainage test. The tree, shrub or planting pits shall be filled with water and shall drain completely within a 24 hours period to be acceptable for planting. Unsuitable materials shall be removed from planting areas. Notify Landscape Architect upon such occurrences.
5. Contractor to scarify and roughen bottom and sides of pit to ensure that glazing of clay pit does not occur. Contractor to be responsible to provide adequate drainage through shrub beds to prevent waterlogging of plants.
6. Planting soil shall NOT be compacted after installation. Plant material must be installed within five (5) days of soil installation to reduce compaction. If plant material is not installed and planting soil is compacted, the Contractor will have to remove the planting soil and replace with new un-compacted soil.

## 3.4 PLANTING TREES AND SHRUBS

A. Protect all areas from excessive compaction when trucking plants or other material to the planting site. Protect existing site amenities during landscape operations.

B. All plants shall be set upright and plumb in center of hole. Plants or trees in formal plantings shall be laid out according to the dimensions on plans. Plants shall be set to give best appearance. All plants shall set level with finished grade upon completion of planting operations. Adjust tree and shrub elevations should settling occur.

C. Set balled and burlapped stock plumb and in center of pit or trench with top of ball raised above adjacent finish grades as indicated.

1. Place stock on setting layer of compacted planting soil
2. Remove burlap and wire baskets from tops of balls and partially from sides, but do not remove from under balls. Remove pallets, if any, before setting. Do not use planting stock if ball is cracked or broken before or during planting operation.
3. Remove all plastic fabrics, containers, ropes, and wires from rootballs and tree canopies.
4. Backfill with planting mix around ball in layers, tamping to settle backfill and eliminate voids and air pockets. When pit is approximately 1/2 backfilled, water thoroughly before placing remainder of planting mix. Repeat watering until no more is absorbed. Water again after placing and tamping final layer of planting mix.

D. Set container-grown stock plumb and in center of pit or trench with top of ball raised above adjacent finish grades as indicated.

1. Carefully remove bottom of plant containers before planting. Remove sides of container without damage to root ball after positioning plant and partially backfilling.
2. Remove all plastic fabrics, containers, ropes, and wires from shrubs and tree canopies.
3. Place stock on setting layer of compacted planting soil
4. Backfill with planting mix around ball in layers, tamping to settle backfill and eliminate voids and air pockets. When pit is approximately 1/2 backfilled, water thoroughly before placing remainder of planting mix. Repeat watering until no more is absorbed. Water again after placing and tamping final layer of planting mix.

E. Plants shall be installed in straight rows and evenly spaced to fill bed, unless otherwise noted, and at intervals called out in the drawing. Triangular spacing shall be used unless otherwise noted on the drawings.

F. Dish and tamp top of backfill to form a 4-inch high retention basin around the rim of the pit. Do not cover top of root ball with planting mix.

G. After installation of all shrubs, groundcover and annuals, plantings shall be watered thoroughly. Any settling of plants or finished grade that occurs shall be repaired prior to installation of mulch. Finished grade of planting beds to be 3” below finished grade of adjacent pavement or curb. Refer to details on Landscape Plans.

## 3.5 TREE AND SHRUB PRUNING

A. Prune, thin, and shape trees and shrubs ONLY as directed by Owner/Landscape Architect.

## 3.6 TREE STAKING

A. Staking: Stake all trees according to detail. Set guy anchors to avoid penetrating root balls or root masses. Support trees with web strapping connected to biodegradable twine at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.

B. Palm Staking: Stake according to detail. All Bracing to be painted. Color to be determined by landscape architect/owner.

## 3.7 MULCHING

A. Mulch backfilled surfaces of tree pits and all shrub and other plant areas at a three (3) inch depth.

## 3.8 CLEANUP AND PROTECTION

A. During landscaping, keep pavements clean and work area in an orderly condition.

B. Protect landscaping from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

## 3.9 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of it off the Owner’s property.

## 3.10 ACCEPTANCE

A. The landscape will be reviewed provided all work complies with the specifications and drawings and all plants are in healthy, vigorous condition. Inspection to determine substantial completion of planted areas will be made by Landscape Architect upon Contractor’s request.

B. Substantial Completion will be granted when all plant material has been installed and completed and clean up on site has occurred.

C. Final Acceptance will be granted when:

1. All trees planted on site that are deemed unacceptable have been replaced and a fresh layer of mulch has been installed in all tree rings.
2. All shrubs and groundcovers planted on site that are deemed unacceptable have been replaced and a fresh layer of mulch has been installed in all bed areas.
3. items listed on punch lists and field reports have been completed.

## 3.11 OBSERVATION SCHEDULE

A. The Contractor shall be responsible for notifying the Landscape Architect in advance for the following site visits, according to the time indicated:

1. Pre-job conference – 7 days
2. Final grade review – 48 hours
3. Plant material review – 48 hours
4. Plant layout review – 48 hours
5. Soil preparation and planting operations. One tree with each type of specified staking shall be approved prior to planting of trees – 48 hours
6. Substantial Completion/Pre-maintenance – 7 days
7. Final walk-through – 7 days

B. When observations are conducted by someone other than the Landscape Architect, the Contractor shall show evidence in writing of when and by whom these observations were made.

C. No site visits shall commence without all items noted in previous Observation Reports either completed or remedied unless such compliance has been waived by the Owner. Failure to accomplish punch list tasks or prepare adequately for desired inspections shall make the Contractor responsible for reimbursing the Landscape Architect at his current billing rates per hour (plus transportation costs). No further inspections shall be scheduled until this charge has been paid and received.

## 3.12 EXPIRATION OF GUARANTEE PERIOD

A. The Contractor shall be responsible for notifying the Owner 30 days prior to the expiration of the warranty period (see section 1.7). The Contractor shall coordinate a meeting at such time with the Owner and Landscape Architect to inspect all plant material for its health. All plant material deemed dead or unhealthy is to be replaced at the Contractor's expense and shall be guaranteed for a time period equal to that of the original warranty. Contractor shall remove all staking, guying, and wrapping materials at the end of the warranty period.

**END OF SECTION**

# SECTION 32 96 00

# TRANSPLANTING

## PART 1 GENERAL

### 1.0 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications Sections, apply to this Section.

B. Should this Section specify requirements in conflict with the Construction Drawings package, Construction Drawings package shall govern.

### 1.1 SCOPE

A. Provide all equipment and materials, and do all work necessary to transplant existing trees, as indicated on the Drawings, as specified herein, and as designated in the field by the Architect.

B. Refer to “Tree Disposition Notes” included on Drawing Sheet LD-101.

### 1.2 RELATED WORK

A. Examine Contract Documents for requirements that affect work of this Section. Other Specification Sections that directly relate to work of this Section include, but are not limited to:
1. Section 01 56 39, TEMPORARY TREE AND PLANT PROTECTION.
2. Section 02 4 119, SELECTIVE DEMOLITION.
3. Section 32 84 00, IRRIGATION.
4. Section 32 92 00, LAWNS AND GRASSES; New lawn and grass areas.
5. Section 32 93 00, PLANTING; New planting.

## 1.3 REFERENCES

A. Comply with applicable requirements of the following standards. Where these standards conflict with other specified requirements, the most restrictive requirement shall govern.

1. American National Standards Institute (ANSI):

| | |
|---|---|
| Z60.1 | American Standard for Nursery Stock (Sponsor: American Association of Nurserymen, Inc.) |

2. “Florida Grades and Standards for Nursery Plants 2015”, Florida Department of Agriculture and Consumer Services.

3. National Arborist Association, 3537 Stratford Rd., Wantagh, NY 11793 (NAA):

| | |
|---|---|
| Ref. 1 | Transplanting of Trees and Shrubs in the Northeastern and North Central United States |

4. International Society of Arboriculture (ISA):

Tree and Shrub Transplanting Manual

## 1.4 SUBMITTALS

A. A transplanting plan shall be submitted showing existing and proposed locations of transplanted material. The plan shall also delineate methods and times for root pruning, digging, balling, removing, storing, transporting, planting, watering, and maintenance to ensure survivability. The plan shall also include equipment, anti-desiccant, and pesticides to be used. A listing of the plant material to be transplanted shall be provided by common name and botanical name as listed under "Nomenclature" in ANSI Z60.1; classification; caliper; and height.

## 1.5 QUALITY ASSURANCE

A. State Landscape Contractor's License & Tree Relocation

1. References: Contractor shall be a professional tree moving company holding a landscape contractor's license in the state where the work is to be performed and have a minimum of 10 years tree relocation experience. Submit a copy of license and 3 references of tree relocation work in the past 5 years.

B. Unless otherwise specified herein, tree transplanting shall conform to NAA Ref. 1.

C. Contractor shall obtain and pay for permits and fees for the alteration of overhead lines or any other related moving permit or fee that requires compliance with Federal, State and local regulatory requirements.

D. The Contractor shall provide a clear 4 inch by 6 inch minimum size color photograph of the plant material to be relocated prior to any activity. Trees shall be documented by an individual photograph of each tree or palm to be transplanted. Photographs shall indicate the date and species of each plant on the back or front of each photo.

E. Commercial test from an independent testing laboratory including basic soil groups (sand, silt, clay, pH (ASTM D 4972), soluable salts), secondary nutrient groups (calcium, magnesium, sodium, Sodium Absorption Ratio (SAR)), micronutrients (zinc, manganese, iron, copper). Soil required for each test shall include a maximum depth of 18 inches of approximately 1 quart volume for each test. Areas sampled shall be from newly proposed tree relocation site and should contain at least 6-8 cores for each sample area and be thoroughly mixed. Problem areas should be sampled separately and compared with samples taken from adjacent non-problem areas. The location of the sample areas should be noted and marked on a parcel or planting map for future reference.

F. Immediately following rough grading operation, identify a typical location for one of the largest trees and excavate a pit per the project details. Fill the pit with water to a depth of 12 inches. The length of time required for the water to percolate into the soil, leaving the pit empty, shall be measured by the project Architect. Within six hours of the time the water has drained from the pit, the Contractor, with project Architect present, shall again fill the pit with water to a depth of 12 inches. If the water does not completely percolate into the soil within 9 hours, a determination shall be made and submitted by the Contractor and verified and approved by the Architect, whether a drainage system or a soil penetrant will be required for each tree and or shrub being transplanted.

## 1.6 SEASON FOR TRANSPLANTING

A. Factors determining planting season include soil moisture and temperature, exposure, growth stage of plant, plant hardiness, inherent nature of the species, and use of antitranspirants.

1. Transplanting periods shall be in accordance with “Florida Grades and Standards for Nursery Plants 2015” and approved by the Owner and Architect.

## 1.7 TIME LIMITATION

A. The time limitation from digging, removing, transporting, to installing transplanted plant material shall be the same day. The time limitation between installing the plant material and placing the mulch shall be a maximum 48 hours. If project conditions prevent the Contractor from transplanting and installing plant material on the same day, plant materials shall be boxed or heeled in as required. Plant material shall be maintained and protected by the Contractor.

## 1.8 GUARANTEE

A. Transplanted plant material shall have a guarantee period of 365 days. All plants that die or have 20 percent or more of their branches that die during the construction operations or the guarantee period, shall be replaced in kind in relation to size and species during the planting season.

## 1.9 SITE CONDITIONS

A. Transplanting Conditions: All transplanting operations shall be performed only during periods when beneficial results can be obtained. When drought, excessive moisture, frozen ground, or other unsatisfactory conditions prevail, the work shall be stopped when directed. When special conditions warrant a variance to all transplanting operations, proposed transplanting times shall be submitted for approval. The installing site for the plant material shall be prepared and excavated in accordance with Section 31 20 00, EARTH MOVING (or Civil Drawings) and Section 32 93 00, PLANTING, prior to removing the plant material. If project conditions prevent the Contractor from transplanting and installing plant material on the same day, plant material shall be boxed or heeled in as required. Plant material shall be maintained by the Contractor until a suitable planting time.

B. Underground Utilities: The location of underground utilities and facilities at both the removal and installing sites shall be verified and marked. Damage to underground utilities and facilities shall be repaired at the Contractor's expense.

C. Protecting Existing Vegetation: When there are established lawns at either the removal or installing sites, the turf shall be protected during the operation. Existing trees, shrubs, and plant beds at the removal and/or installing sites that are to be preserved shall be barricaded and protected from damage by a tree barricade or other measure. Damage to existing plant material shall be mitigated by the Contractor at no additional cost to the Owner. Damage shall be accessed by a state certified arborist or other approved professional using the National Arborist Association's tree valuation guideline.

D. Protection of Plant Material to be Transplanted: Contractor shall protect plant material slated for transplanting that is not transplanted at the beginning of construction operations. Prior to construction operations, Contractor shall tag plants to be transplanted with plastic or vinyl tape tied to the plant caliper. Plants to be transplanted shall be protected from root compaction and any other damage as specified in Section 01 56 39, TEMPORARY TREE AND PLANT PROTECTION, prior to the start of any construction operations. Where tree drip lines are greater than 10 feet from the tree's trunk, locate barrier fencing at the drip line of the tree. Plastic tape and barrier fencing shall not be removed until transplanting operations are ready to begin and or instructed by the Architect. Contractor shall water and prune plant material as necessary to keep healthy and vigorous, particularly when water is shut off. Contractor shall be responsible for watering existing plant material to be transplanted from the start of construction operations until the maintenance period is over or until regular irrigation service is in working order. Outside storage locations shall be continually shaded and protected from the wind. Plants stored on the project shall be always protected from any drying covering the balls or roots with moist sawdust, wood chips, shredded bark, peat moss, or other similar mulching material.

E. Protection of Plant Material During Transplanting: Plant material shall be protected during transplanting to prevent desiccation and damage to the branches, trunk, and root system. Branches shall be protected by tying-in. Exposed branches shall be covered during transport. The root area shall be treated with mycorrhizal fungi inoculum. Plant material shall be undamaged, vigorous and healthy with a well-branched root system, free from disease, harmful insects and insect eggs, sun-scald injury, disfigurement or abrasion after transplanting. Plant material showing desiccation, abrasion, sun scald injury or structural branching damage shall be replaced at no cost to the Owner.

# PART 2 PRODUCTS

## 2.1 STORAGE AREA SECURITY FENCING

A. Fencing shall be the following:

1. Polyethylene mesh fencing, or other Owner approved material; height indicated on the Drawings.
2. Fabric shall be fluorescent orange, high density polyethylene 1-1/2 in. square mesh.
3. Stakes shall be pressure treated pine.

B. Stakes for fencing shall be driven into the ground, except above utility locations where surface anchors shall be used. Posts shall be spaced 16 ft. o.c. maximum.

## 2.2 SOIL AMENDMENTS

A. Bone meal shall be readily available steamed bone meal, useable as a natural organic nitrogen fertilizer.

B. High phosphorous fertilizer (0-20-0); (4-12-4); (5-10-5) at rate of 10 lbs. per cubic yard of backfill, or (0-46-0) at rate of 5 lbs. per cubic yard of backfill.

C. Compost, topsoil, and planting soil shall be as specified in Section 329300, PLANTING.

D. Wetting Agents: Harrell HydroMAX Wetting Agents, Manufactured by Harrell's 5105 New Tampa Highway, Lakeland, FL 33815, or approved equal ;

Phone: (800) 282-8007
(863) 687-2774
Fax: (863) 688-8836

## PART 3 EXECUTION

### 3.1 INSTALLATION OF STORAGE AREA FENCING

A. Prior to start of transplanting work, security fencing for storage area shall be installed in accordance with the following:

1. Fencing shall be installed at the storage areas indicated on the Drawings, or as directed by the Owner or Architect.
2. Fencing shall include a locking gate.

3.2 PLANT MATERIAL

A. Preparation: Plant material designated for transplanting shall be watered thoroughly several days before root pruning, digging, or moving. Broken or interfering growth shall be pruned. Large canopy and specimen plant material shall be wire balled and burlapped. Mark north side of plants prior to excavation. Relocate in new location with north facing same direction.

### 3.3 FINISH GRADE AND TOPSOIL

A. The Contractor shall verify that finish grades are as indicated on drawings, and that the placing of topsoil, the smooth grading, and the compaction requirements have been completed in accordance with Section 329119, LANDSCAPE GRADING, prior to the commencement of the transplanting operation.

### 3.4 TRANSPLANTING - GENERAL

A. Condition: Deciduous trees 4 in. caliper and larger shall be moved by boxing or wired balled and burlapped. Deciduous trees smaller than 4 in. caliper, shall be moved balled and burlapped, or with a tree spade during dormant periods. Evergreens, deciduous shrubs, and small trees in leaf shall be moved balled and burlapped.

B. Prior to digging, tie in all lower branches to prevent damage during handling and transplanting operations.

C. Digging, Wrapping, and Handling: Plants shall be dug and prepared for moving in a manner consistent with ISA Transplanting Manual. Digging, wrapping, and handling operations shall not cause damage to branches, shape, root system, and development during storage.

1. Deciduous small trees in full leaf when dug in late spring or early summer shall be hardened-off before replanting. Plants shall be placed in cool, moist, protected area as soon as possible after digging. Place plants close together and provide means for keeping root balls continually moist. Cover balls with bark mulch, straw, canvas, or other acceptable material. Maintain plants in this condition for 24 to 48 hours before replanting.
2. Proper equipment shall be available for loading, unloading, and/or transporting plants weighing more than 500 lbs.

D. Balled and Burlapped Plants: Balls shall be firmly wrapped with burlap or approved cloth substitute. No balled plant will be acceptable if the ball is cracked or broken, or if the stem is loose in the ball, either before or during transplanting. Balled plants shall be lifted and handled from the bottom of the ball. Protect ball and deliver to the relocation site, plant immediately, and water thoroughly. Ball sizes shall be as recommended in ANSI Z60.1.

## 3.5 TEMPORARY STORAGE

A. Shrubs unable to be planted immediately shall be heeled in and protected from drying by the sun and wind. Heeling-in shall include setting plants in area with good surface drainage, and covering balls with fresh wood chips, bark mulch, sawdust, or peat. Create walled bins around plants with concrete masonry block, wire fencing, or timbers to maintain complete coverage of rootballs. Watering shall be maintained to keep balls moist, and reduce heat produced by piled mulch during hot weather. Maintain depth of mulch during entire storage period.

1. Shrubs stored for several months shall receive a dilute solution of a soluble fertilizer applied to tops of root balls two or three times during the growing season.

## 3.6 B&B PLANT MATERIALS

A. Immediately before digging and following consultation with the Architect, spray all evergreen or deciduous trees in full leaf with Transplant Biostimulant, applying an adequate film over trunks, branches, twigs, and foliage and apply Transplant Biostimulant to the root ball area.

B. Dig, and ball and burlap (B&B) plants with firm, natural balls of earth, of depth and diameter not less than that recommended by the American Standard for Nursery stock. Plants moved with a ball will not be accepted if the ball is cracked or broken before or during planting operation. Remove all grass, weeds and accumulated soil resulting from nursery cultivation from the top of the root ball prior to digging so that the original trunk flare shows on top of the root ball.

C. Use only natural burlap and jute twine. Do not use synthetic fibers or wire to ball and burlap root balls. Wire baskets will be acceptable if removed in accordance with these specifications.

D. All plant material in transit or temporary stored shall be covered with burlap or similar covering to keep plants from drying out.

## 3.7 TRANSPLANTING WITH MECHANICAL TREE SPADE

A. Blades of tree spade shall be sharp and kept sharp during digging operations to prevent tearing and shredding of roots. Size of machine shall be adequate in relation to size of tree to be moved. Equipment determined by Architect to be too small will not be permitted for transplanting work.

1. Size requirements of soil ball for various size trees shall be in strict conformance with ANSI Z60.1.

B. Specific care in digging, handling, and transporting palms shall be given in accordance with Florida Grades and Standards for Nursery Plants.

C. Before digging, mark north side of trunk. Whenever possible, replant tree with same orientation as it originally grew to reduce possible sunscald damage to trunk.

D. Dig hole for tree with same sized equipment as will dig the plant material and then dig plant and transport it to required location.

1. During digging of new hole and digging tree itself, operator shall use leveling bubble to level machine and ensure tree will be vertical when planted. Special care shall be taken during insertion of tree spade blades to produce a balanced root ball which can be planted vertically in the new hole.
2. New tree pit shall be minimum of 2 ft. larger than diameter of root ball.
3. When sides of new planting pit appear glazed, or consist of heavy clay, use hand spade to break up surface before planting. In case of heavy clay soils, enlarge plant pit size created by machine.

E. After digging plant material, and prior to transporting, tie tree limbs in and protect tree from drying out during transport. Trees shall be protected by anti-desiccant spray and/or a plastic or fabric cover.

F. Thoroughly mix a slurry mix of the following in the tree pit:*

| Material | Quantity* |
|---|---|
| Compost | 5 cu. ft. |
| Planting soil | 5 cu. ft. |
| Bone meal | 20 lbs. (or high phosphorous fertilizer at rates described in Part 2) |
| Water | Enough to fill bottom third of tree pit |

*Quantities listed are for 66 in. tree spade. For larger or smaller units, quantities shall be adjusted accordingly.

G. Position tree in hole as directed by Architect and remove tree spade.

H. Immediately after removal of tree spade, the tree shall be watered completely, all air gaps in slurry mixture shall be filled by working a spade handle or other tool around the entire perimeter of the ball.

1. If considerable backfill is necessary, tree shall be temporarily staked or guyed to prevent movement during backfilling operations. Once tree is backfilled to degree that disturbing alignment is no longer a concern, properly re-guy and/or stake tree in conformance with Section 32 93 00, PLANTING.

I. Tree shall be watered via injection into root ball until entire ball is saturated.

J. Water root balls with Ortho "Up-Start" or approved equivalent, once every two weeks for first 8 weeks after transplanting.

K Mycorrhizal fungi inoculum shall be added as recommended by the manufacturer for the plant material specified.

L. Completion of planting shall conform to Section 32 93 00, PLANTING.

**END OF SECTION**

# APPENDIX A

PRELIMINARY GEOTECHNICAL EXPLORATION REPORT

DC ALEXANDER PARK
Fort Lauderdale, Florida

# GFA INTERNATIONAL

**FLORIDA'S LEADING ENGINEERING SOURCE**

# Preliminary Geotechnical Exploration Report

## DC Alexander Park

**Fort Lauderdale, FL**

**March 20, 2020**
**GFA Project No.: 19-7566.00**

**Prepared for: Keith and Associates, Inc.**

March 20, 2020

Mr. Roberto Goncalves Jr.
**Keith and Associates, Inc.**
301 East Atlantic Blvd.
Pompano Beach, FL 33066
Phone : (954) 830-1716
Email : RGoncalves@keithteam.com

**RE: Preliminary Geotechnical Exploration Report**
**DC Alexander Park**
**SE 5th St. & A1A North,**
**Fort Lauderdale, Florida**
**GFA Project No.: 19-7566.00**

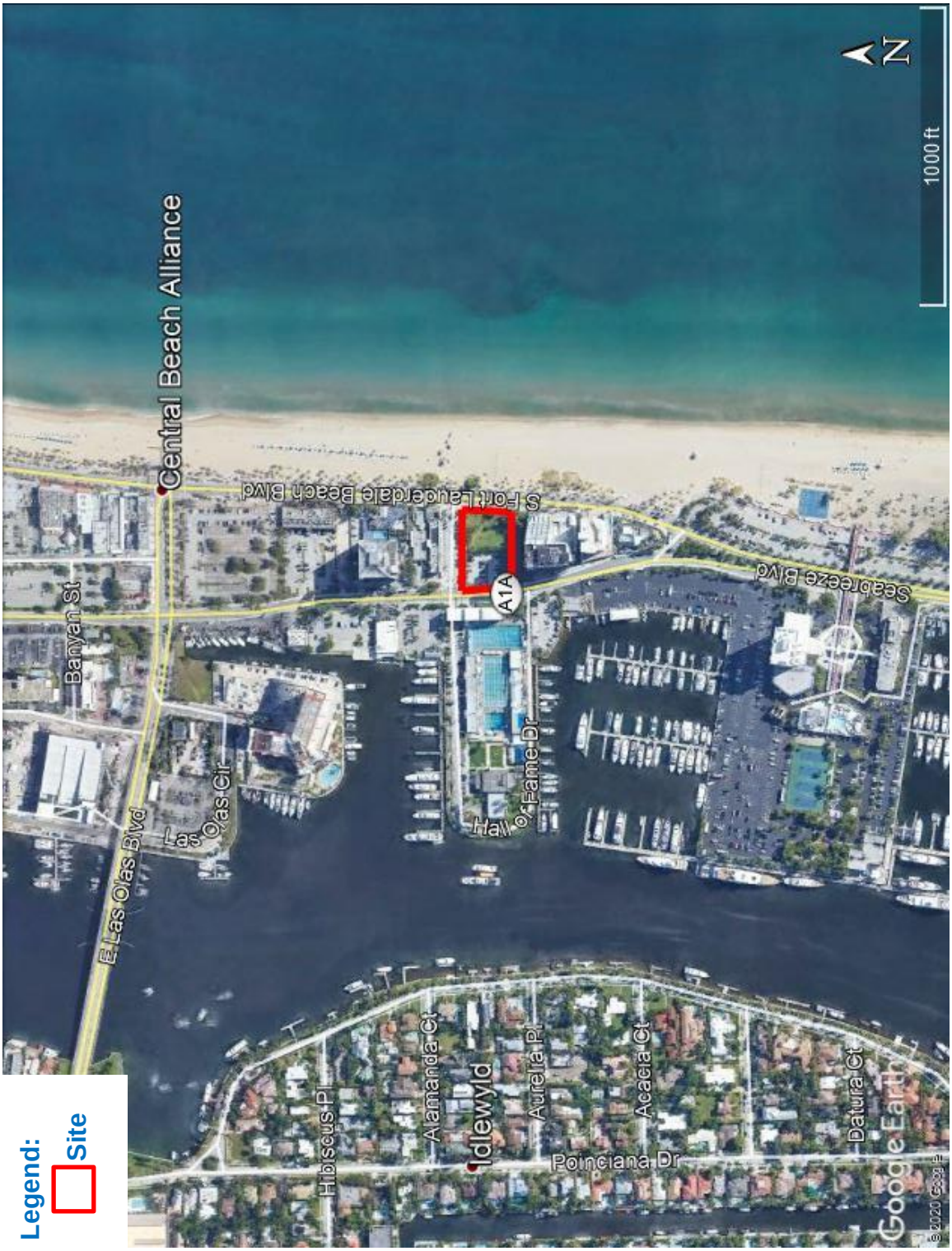
Dear Mr. Goncalves:

In accordance with your authorization, GFA International, Inc. (GFA) has completed the subsurface exploration for the above referenced project in accordance with the signed geotechnical service agreement for this project dated February 21, 2020.

This Preliminary Exploration Report is intended to provide upfront geotechnical recommendations for the subject project. Once the structural design commences, more accurate loads are available, and the on-site structures are demolished, GFA will perform a final exploration and submit a design level geotechnical report containing more detailed recommendations for site preparation and foundation design.

## 1.0 PROJECT DESCRIPTION

It is GFA's understanding that this project is to consist of the construction of a bathroom, sculptural canopy, and sloped walkway with associated retaining walls and access stairs, parking spaces, and a playground in Fort Lauderdale, Florida. A site plan prepared RGD Consulting Engineers, dated December 13, 2019, and conceptual booklet prepared by Keith and Associates, dated November 4, 2019, were provided by the client. **Figure 1** shows the location of project with respect to existing streets and features. At this time, no structural information is available to GFA. However, GFA has assumed that the construction will consist of the use of reinforced concrete, masonry, and structural steel. Since portions of the planned structures are to be constructed seaward of the Coastal Construction Control Line (CCCL), recommendations for foundation support will consist of deep pile foundations.




**DC Alexander Park**
**SE 5TH Street & A1A North**
**Fort Lauderdale, Florida**
**GFA Project No.: 19-7566.00**

# Figure 1 – Site Location Plan


NOTE: BORING LOCATIONS WERE LOCATED USING A MEASURING TAPE AND EXISTING LANDMARKS AS REFERENCE POINTS. IN ADDITION, THE LATITUDE, LONGITUDE, AND ELEVATION NOTED ON THE BORING LOGS WERE TAKEN FROM GOOGLE EARTH. THEREFORE, LOCATIONS SHOWN ON THE PLAN ARE APPROXIMATE.

## FIGURE 2 – BORING LOCATION PLAN

## 2.0 FIELD INVESTIGATION

GFA's scope of work consisted of drilling six (6) Standard Penetration Test (SPT) borings to depths of 20 to 40 feet below ground surface (BGS) at the locations shown in **Figure 2**. Penetration tests were performed in substantial accordance with ASTM Procedure D-1586, "Penetration Test and Split-Barrel Sampling of Soils". This test procedure consists of driving a 1.4-inch I.D. split-tube sampler into the soil profile using a 140-pound automatic hammer falling 30 inches. The number of blows per foot, for the second and third 6-inch increment, is an indication of soil strength. The SPT borings were performed using a GeoProbe 7822 DT track mounted drill rig equipped with an automatic hammer. The soil samples recovered from the soil borings were classified and stratified by a geotechnical engineer. Following completion of the field services, all boreholes were backfilled with excavated soil/rock, and the site generally cleaned, as required.

The results of the classification and stratification are encountered during GFA's exploration are presented in the **Appendix A** "Record of Test Boring". It should be noted that soil conditions might vary between what is depicted on the attached log and other areas of the site. The soil boring data reflect information from a specific test location only. Site specific survey staking for the test location was not provided for GFA's field exploration. The boring location was determined in the field by a project engineer by measuring distances and estimating right angles from existing site features. The boring location should, therefore, be considered approximate. The boring depths were confined to the zone of soil likely to be stressed by the proposed construction.

The boring log depicts the observed soils in graphic detail. The Standard Penetration Test boring indicates the penetration resistance, or N-values logged during the drilling and sampling activities. Please refer to **Appendix B** "Notes Related to the Test Borings" for further clarification of GFA's field exploration. The classifications and descriptions shown on the log are generally based upon visual characterizations of the recovered soil samples. All soil samples reviewed have been depicted and classified in accordance with the Unified Soil Classification System symbols (i.e. SP, SP-SM, SC etc.). See in **Appendix C** "Discussion of Soil Groups", for a detailed description of various soil groups.

## 3.0 SUBSURFACE CONDITIONS

The soil profile generally consisted of loose to dense, fine to medium grained sand with shell fragments from ground surface to an approximate depth of 28 feet below ground surface (BGS). Following this layer, samples secured consisted of medium dense to dense, fine to medium grained sand with cemented sand and shell fragments to the termination depth of 40 feet BGS.

For detailed information on subsurface conditions encountered in the borings, please refer to **Appendix A** "Record of Test Boring" sheets attached to this report.

# 4.0 ENGINEERING EVALUATION AND PRELIMINARY RECOMMENDATIONS

## *4.1 Hydrogeological Conditions*

Groundwater was encountered at approximate depths from 8'2" to 10'2" BGS during drilling operations (March 2020). It should be noted that groundwater levels will fluctuate seasonally depending upon local rainfall and tidal fluctuations. Brief ponding of stormwater may occur across the site after heavy rain events.

As part of GFA's field exploration, GFA performed two (2) exfiltration tests to a depth of 10 feet below existing grade in accordance with the South Florida Water Management District method for open-hole constant head field testing. The tests were conducted at the areas presented in **Figure 1.** The calculated hydraulic conductivity coefficients for the exfiltration tests were:

| EXFILTRATION TEST NO. | HYDRAULIC CONDUCTIVITY, K ($FT^3/SEC/FT^2$-FT) |
|---|---|
| EX-1 | $2.5 \times 10^{-4}$ |
| EX-2 | $3.0 \times 10^{-4}$ |

The test results are presented in **Appendix D.**

No additional investigation was conducted in relation to any existing well field in the vicinity. Well fields can influence water table levels and cause significant fluctuations. If a more comprehensive water table analysis is necessary, GFA recommends contacting a registered professional specialized in hydrogeology.

## *4.2 Preliminary Foundation Recommendations*

Based on the results of the subsurface exploration, the anticipated foundation loads, and the structure being partially eastward of the Coastal Construction Control Line (CCCL), GFA recommends that the proposed structures be supported on a deep foundation system consisting of augered cast-in-place piles (ACIP). The auger-cast piles are considered the most appropriate type of deep foundation system for the support of the proposed structures. This system can be constructed with the least amount of noise/vibration while still providing resistance to compression, lateral and uplift forces. The auger-cast piles will develop their axial compressive capacity through a combination of end-bearing and side shear (skin friction) between the periphery of the grouted pile and the layers of sand and limestone through which the piles penetrate.

From a preliminary design standpoint, 14-inch diameter auger-cast piles can be considered for use in supporting the proposed structures. The preliminary allowable pile compression and tension capacities together with estimated pile depths are presented in the following table:

| Pile Diameter | Pile Tip Depth (from existing grade of drilled locations) | Minimum pile tip elevation* | Allowable Compression Capacity | Allowable Tension Capacity | Allowable Lateral Capacity – Fixed Head » | Minimum Required Grout Strength |
|---|---|---|---|---|---|---|
| 14 in | 35 feet | -26 ft NAVD | 40 tons | 10 tons | 5 tons | 5,000 psi |

* Assuming existing grade elevation to be +9 ft NAVD at the location of the borings.
» Lateral Capacity based on maximum lateral deflection of 0.25 inches.

Lateral load capacities were given for 0.25 in displacement, and a factor of safety was not applied to these figures.

Please note that structural stresses in the piles may impose a more severe limitation on the design capacity; therefore, GFA recommends the allowable stresses be verified for the selected pile section.

The proposed piles should be constructed to a **minimum elevation of -26 ft NAVD (assuming existing ground elevation of +9 ft NAVD)** as determined by the inspecting Geotechnical Engineer.

## Pile Installation

Pile design and installation shall be in accordance with the applicable sections of the Florida Building Code and other applicable federal, state and local requirements. In addition, ACIP pile installation procedures should be performed in accordance with the guidelines presented in the latest edition of the *Deep Foundations Institute's Augered Cast-In-Place Pile Manual*. GFA recommends that the minimum grout compressive strength be **5,000 psi**.

In addition, piles should be installed in accordance with the following:

1. Depth – Preliminarily, the proposed piles should be constructed to a minimum tip elevation of -26 ft NAVD (assuming existing grade to be at +9 ft NAVD) as determined by the inspecting Geotechnical Engineer. **The contractor should note that hard drilling may be encountered in dense limestone layers.** If practical refusal (less than 1 foot per minute of drilling) is obtained, the allowable compression and tension capacities will be affected.

2. Spacing - Piles installed in groups should be spaced at a center-to-center distance of not less than 3 pile diameters.

3. Plan Location - The center of the top of any pile at cut-off should be displaced laterally no more than 3 inches from the position shown on the plans. This applies to both single piles and piles installed in groups.

4. Vertical Alignment - The vertical alignment of the piling should not deviate from the plumb by more than 1/4 inch per foot of length.

5. Reinforcing Cage Positioning - The top of the reinforcing cages installed in the piling should not be more than 6 inches above and no more than 3 inches below the positions shown in the plans. The reinforcing cages should be positioned concentrically within the grouted pile shaft. The grout cover over longitudinal reinforcing bars should not be less than 3 inches.

6. Adjacent Piles - A minimum time period of 24 hours should be specified for the installation of piles located within 6 pile diameters, center-to-center, of each other.

7. Grout Factor - The minimum acceptable grout factor (i.e. actual grout volume divided by theoretical grout volume) should be 1.2. NOTE: Based on the soils encountered during the SPT borings, higher grout factors are anticipated.

## *4.3 Floor Slab*

Based on GFA's understanding of the proposed project development and the existing soils within the site, the ground floor slab may be supported directly on a granular fill pad following site preparation and foundation construction outlined in this herein. For purposes of design, a modulus of subgrade reaction of 150 pounds per cubic inch may be used. GFA recommends the following for any slab on grade areas.

1. For slabs areas, compaction with a vibratory plate compactor should be performed. GFA recommend a small vibratory plate compactor (i.e. Supra Wacker, Model DPU 6055, Weight 472 kg, kW 96 or equivalent). Upon completion of the compaction, density tests shall be performed to confirm a minimum compaction compliance of 95 percent of modified proctor maximum density (ASTM D-1557). Additional passes may be necessary if compliance compaction is not achieved.

2. Perform compliance tests within the slab and footing areas at a frequency of not less than one test per 2,500 square feet in the slab area and one test at each isolated column footing.

It is likely that proof-rolling and any subsequent backfill compaction with the aforementioned equipment may induce ground vibrations that can affect the existing adjoining structure. A representative from GFA's office can monitor the vibration disturbance using seismograph equipment capable of recording ground velocities that can be used to determine if construction activity at the site is exceeding tolerable vibration levels on adjacent structures as established by the project structural engineer.

Water vapor is likely to rise through the granular fill and condense beneath the base of the floor slab. If moisture entry into the floor slab is not desirable, an impermeable membrane should be installed at the slab bottom - subgrade interface.

## *4.4 General Site Preparation*

GFA's recommendations for site preparation are for civil improvements. This approach to improving and maintaining the site soils has been found to be successful on projects with similar soil conditions.

1. The demolition and removal of existing structures, paved roads, etc., including utilities and footings is required prior to constructing. Following site stripping, clearing, and grubbing, areas of surficial sand should be compacted prior to the placement of any fill. GFA recommends a steel drum vibratory roller with a minimum static weight of 20,000 lbs. and minimum vibratory impact energy of 50,000 lbs. The roller should be operated at 2 mph making at least 10 perpendicular overlapping passes. Densification should continue until no further settlement can be visually discerned at the excavated surface. No section of the subgrade should receive less than 4 passes of the roller or until at least 98% maximum density (ASTM D 1557) is achieved for a depth of at least 1 foot below the excavated surface. Upon completion of the proof rolling, backfill shall be placed in maximum 12-inch loose lifts and compacted to a minimum density of 98 percent of the Modified Proctor maximum dry density (ASTM D-1557).

2. Place fill material, as required. The excavated site soils that do not contain organics or other deleterious material should be suitable for use as engineered fill. The fill material should be inorganic (classified as SP, SW, GP or GW) containing not more than 5 percent (by weight) organic materials. Fill should be placed in maximum 12-inch loose lifts and compacted to a minimum density of 98 percent of the Modified Proctor maximum dry density (ASTM D-1557) with a vibratory roller as mentioned in item #1. If more than 2 feet of fill above existing grade is needed, the designers should contact GFA's office to evaluate its impact.

3. Perform compliance tests within the fill at a frequency of not less than one test per 2,500 square feet per lift in the building areas, or at a minimum of 2 test locations per lift, whichever is greater.

4. The contractor shall take into account the final contours and grades as established by the plan when executing his backfilling and compaction operations.

The proposed construction will be within close proximity to existing structures and roadways that maybe susceptible to damage from vibration generated at the site. GFA recommends that during all aspects of construction, the bordering landmarks be monitored using a seismograph to determine the extent of vibration absorption that these features will be subject to. The seismograph used to monitor at this site should have the capability to measure ground velocities along vertical, transverse, and longitudinal axes. The project structural engineer should establish allowable ground velocities that the bordering facilities can safely withstand without any damage.

As noted earlier, the intent of this preliminary exploration report is to provide upfront recommendations so that you can proceed with the design. A formal geotechnical report

will be prepared and issued for this project at a later date after GFA's final exploration is completed. In the meantime, GFA trusts this preliminary exploration report and attachments are sufficient for your current needs; however, should you have any questions or should additional information be required, please do not hesitate to contact GFA's office.

## 5.0 FUTURE INVESTIGATION

**The findings and recommendations provided in this report were based on subsurface information collected from a limited number of test borings. As the project moves forward, a site plan is developed, and existing structures are demolished, a confirmation geotechnical investigation will be required to obtain specific subsurface soil information within the proposed building locations and use that information to assess the recommendations of this report and potential future development changes.**

## 6.0 REPORT LIMITATIONS

This preliminary consulting report has been prepared for the exclusive use of the current project owners and other members of the design team for the **DC Alexander Park** project. This report has been prepared in accordance with generally accepted local geotechnical engineering practices; no other warranty is expressed or implied. The evaluation submitted in this report, is based in part upon the data collected during a field exploration, however, the nature of extent of variations throughout the subsurface profile may not become evident until the time of construction. If variations then appear evident, it may be necessary to reevaluate information and professional opinions as provided in this report. In the event changes are made in the nature, design, or locations of the proposed structures, the evaluation and opinions contained in this report shall not be considered valid, unless the changes are reviewed and conclusions modified or verified in writing by GFA International. Lastly, in accepting this report, the client understands that the data obtained from the soil borings is intended for foundation analysis only and is not to be used for excavating or backfilling pricing estimates.

**Due to the limited project information, this investigation is preliminary in nature and was limited to minimal site investigation. The recommendations contained herein are extrapolated from the limited soils information gathered. They should not be used for final design until further investigations are made and the recommendations are determined to be valid for the proposed structures.**

**In addition, an environmental assessment regarding the potential for contaminated soil and/or groundwater on this site has not been performed as part of this study. If an assessment is requested, GFA can propose and perform this service.**

## 7.0 BASIS FOR RECOMMENDATIONS

The analysis and recommendations submitted in this report are based on the data obtained from the tests performed at the locations indicated on **Figure 2**. This report does not reflect any variations, which may occur between borings. While the borings are representative of the subsurface conditions at their respective locations and for their vertical reaches, local variations characteristic of the subsurface soils of the region are anticipated and may be encountered. The delineation between soil types shown on the soil logs is approximate and the description represents GFA's interpretation of the subsurface conditions at the designated boring locations on the particular date drilled.

GFA should be provided the opportunity to review the final foundation specifications and review foundation design drawings, in order to determine whether GFA's recommendations have been properly interpreted, communicated and implemented. If GFA is not afforded the opportunity to participate in construction related aspects of foundation installation as recommended in this report or any report addendum, GFA will accept no responsibility for the interpretation of GFA's recommendations made in this report or on a report addendum for foundation performance.

Any third-party reliance of GFA's preliminary geotechnical report or parts thereof is strictly prohibited without the expressed written consent of GFA International. The methodology (ASTM D-1586) used in performing GFA's borings and for determining penetration resistance is specific to the sampling tools utilized and does not reflect the ease or difficulty to advance other tools or materials.

Respectfully Submitted,
**GFA INTERNATIONAL, INC.**
**FBPE CA #4930**

Alberto J. Mercado, E.I.
Project Engineer

Estela G. León Aguilar, M.S., P.E.
Geotechnical Department Manager
Professional Engineer #83307
State of Florida

This item has been digitally signed and sealed by [Estela G. León Aguilar] on the date adjacent to the seal.
Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

## Appendices

Appendix A Record of Test Borings
Appendix B Notes Related to the Test Borings
Appendix C Discussion of Soil Groups
Appendix D Hydraulic Conductivity Test Results

# APPENDIX A

Record of Test Borings

GFA International, Inc.
1215 Wallace Dr.
Delray Beach, FL 33444
561-347-0070
561-395-5805

# LOG OF BORING B01



**CLIENT** Keith and Associates, Inc
**PROJECT NAME** DC Alexander Park
**PROJECT NUMBER** 19-7566.00
**PROJECT LOCATION** SE 5th St. & A1A North, Ft. Lauderdale, FL
**DRILLING CONTRACTOR** GFA International Inc.
**HOLE DEPTH** 40 ft
**HOLE DIAMETER**
**DRILLER** Marcos Ruiz
**DATE STARTED** 3/19/20
**COMPLETED** 3/19/20
**DRILL RIG** GeoProbe 7822 DT
**GROUND WATER LEVEL:** ▽ **AT TIME OF DRILLING** 10.17 ft
**METHOD** SPT
**LATITUDE** 26.116462
**LONGITUDE** -80.105034
**NOTE:**
**HAMMER TYPE** 140# with 30 in Drop - Automatic Hammer

| DEPTH (ft) | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % | BLOW COUNTS | N VALUE | MOISTURE CONTENT (%) | ORGANIC CONTENT (%) |
|---|---|---|---|---|---|---|---|
| 1.0 | Medium dense, brown, fine to medium grained SAND (SP) with trace of root fibers. | 1 | 90 | 3 3 6 8 | 9 | | |
| | Medium dense, tan, fine to medium grained SAND (SP) with SHELL fragments. | 2 | 90 | 1 4 8 10 | 12 | | |
| 5 | | 3 | 90 | 8 7 7 6 | 14 | | |
| | | 4 | 90 | 8 8 6 8 | 14 | | |
| | | 5 | 90 | 4 6 6 8 | 12 | | |
| 10 ▽ | | | | | | | |
| | Dense, tan, fine to medium grained SAND (SP) with SHELL fragments. | 6 | 90 | 8 14 15 15 | 29 | | |
| 15 | | | | | | | |
| | Medium dense, tan, fine to medium grained SAND (SP) with SHELL fragments. | 7 | 90 | 6 10 13 13 | 23 | | |
| 20 | | | | | | | |
| | | 8 | 90 | 8 8 8 11 | 16 | | |
| 25 | | | | | | | |
| 28.0 | Medium dense, tan, fine to medium grained SAND (SP) with CEMENTED SAND and SHELL fragments. | 9 | 90 | 6 5 4 4 | 9 | | |
| 30 | | | | | | | |
| | | 10 | 90 | 10 10 11 13 | 21 | | |
| 35 | | | | | | | |

SPT N VALUE ▲ 20 40 60 80
PL MC LL 20 40 60 80
☐ FINES CONTENT (%) ☐ 20 40 60 80

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561-395-5805

# LOG OF BORING B01



**CLIENT** Keith and Associates, Inc **PROJECT NAME** DC Alexander Park

**PROJECT NUMBER** 19-7566.00 **PROJECT LOCATION** SE 5th St. & A1A North, Ft. Lauderdale, FL

| DEPTH (ft) | ELEVATION (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % | BLOW COUNTS | N VALUE | MOISTURE CONTENT (%) | ORGANIC CONTENT (%) | ▲ SPT N VALUE ▲ 20 40 60 80 / PL MC LL 20 40 60 80 / ☐ FINES CONTENT (%) ☐ 20 40 60 80 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Medium dense, tan, fine to medium grained SAND (SP) with CEMENTED SAND and SHELL fragments. *(continued)* | | | | | | | |
| | | | | 11 | 90 | 20<br>6<br>8<br>8 | 14 | | | |
| 40 | | | 40.0 | | | | | | | |

Bottom of borehole at 40.0 feet.

GFA International, Inc.
1215 Wallace Dr.
Delray Beach, FL 33444
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561-395-5805

# LOG OF BORING B02



**CLIENT** Keith and Associates, Inc
**PROJECT NAME** DC Alexander Park
**PROJECT NUMBER** 19-7566.00
**PROJECT LOCATION** SE 5th St. & A1A North, Ft. Lauderdale, FL
**DRILLING CONTRACTOR** GFA International Inc.
**HOLE DEPTH** 40 ft
**HOLE DIAMETER**
**DRILLER** Marcos Ruiz
**DATE STARTED** 3/19/20
**COMPLETED** 3/19/20
**DRILL RIG** GeoProbe 7822 DT
**GROUND WATER LEVEL:** ▽ **AT TIME OF DRILLING** 10.00 ft
**METHOD** SPT
**LATITUDE** 26.116429
**LONGITUDE** -80.10522
**NOTE:**
**HAMMER TYPE** 140# with 30 in Drop - Automatic Hammer

| DEPTH (ft) | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % | BLOW COUNTS | N VALUE |
|---|---|---|---|---|---|
| 0 | Loose, brown, fine to medium grained SAND (SP) with ROOT fibers. | 1 | 90 | 2 3 3 2 | 6 |
| 1.0 | Loose, tan, fine to medium grained SAND (SP) with SHELL fragments. | 2 | 90 | 3 3 3 4 | 6 |
| 5 | | 3 | 90 | 3 3 4 4 | 7 |
| | | 4 | 90 | 4 4 4 4 | 8 |
| | Medium dense, tan, fine to medium grained SAND (SP) with SHELL fragments. | 5 | 90 | 4 4 5 5 | 9 |
| 10 ▽ | | | | | |
| | | 6 | 90 | 6 7 7 8 | 14 |
| 15 | | | | | |
| | | 7 | 90 | 6 7 8 8 | 15 |
| 20 | | | | | |
| | | 8 | 90 | 7 7 10 6 | 17 |
| 25 | | | | | |
| 28.0 | Medium dense, gray, fine to medium grained SAND (SP) with CEMENTED SAND and SHELL fragments. | 9 | 90 | 7 7 5 4 | 12 |
| 30 | | | | | |
| | | 10 | 90 | 20 6 4 8 | 10 |
| 35 | | | | | |

MOISTURE CONTENT (%) | ORGANIC CONTENT (%)

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

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# LOG OF BORING B02



**CLIENT** Keith and Associates, Inc **PROJECT NAME** DC Alexander Park

**PROJECT NUMBER** 19-7566.00 **PROJECT LOCATION** SE 5th St. & A1A North, Ft. Lauderdale, FL

| DEPTH (ft) | ELEVATION (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % | BLOW COUNTS | N VALUE | MOISTURE CONTENT (%) | ORGANIC CONTENT (%) | ▲ SPT N VALUE ▲ 20 40 60 80 PL MC LL 20 40 60 80 ☐ FINES CONTENT (%) ☐ 20 40 60 80 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | Medium dense, gray, fine to medium grained SAND (SP) with CEMENTED SAND and SHELL fragments. *(continued)* | | | | | | | |
| | | | Dense, gray, fine to medium grained SAND (SP) with CEMENTED SAND and SHELL fragments. | 11 | 90 | 14<br>20<br>7<br>3 | 27 | | | |
| 40 | | | 40.0 Bottom of borehole at 40.0 feet. | | | | | | | |

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# LOG OF BORING B03



**CLIENT** Keith and Associates, Inc
**PROJECT NAME** DC Alexander Park
**PROJECT NUMBER** 19-7566.00
**PROJECT LOCATION** SE 5th St. & A1A North, Ft. Lauderdale, FL
**DRILLING CONTRACTOR** GFA International Inc.
**HOLE DEPTH** 20 ft
**HOLE DIAMETER**
**DRILLER** Marcos Ruiz
**DATE STARTED** 3/20/20
**COMPLETED** 3/20/20
**DRILL RIG** GeoProbe 7822 DT
**GROUND WATER LEVEL:** ▽ **AT TIME OF DRILLING** 8.17 ft
**METHOD** SPT
**LATITUDE** 26.116452
**LONGITUDE** -80.105393
**NOTE:**
**HAMMER TYPE** 140# with 30 in Drop - Automatic Hammer

| DEPTH (ft) | ELEVATION (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % | BLOW COUNTS | N VALUE | MOISTURE CONTENT (%) | ORGANIC CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|
| 0 | | | 2" of asphalt atop, dense, tan, fine to medium grained SAND (SP) with LIMESTONE fragments. | 1 | 90 | 28 16 10 11 | 26 | | |
| 1.0 | | | Medium dense, tan, fine to medium grained SAND (SP) with SHELL fragments. | 2 | 90 | 8 6 6 8 | 12 | | |
| 5 | | | | 3 | 90 | 6 6 6 10 | 12 | | |
| | | | ▽ | 4 | 90 | 7 5 4 4 | 9 | | |
| | | | | 5 | 90 | 6 6 6 6 | 12 | | |
| 10 | | | | | | | | | |
| 13.0 | | | Tan, SHELL fragments with some sand, | 6 | 90 | 7 7 7 11 | 14 | | |
| 15 | | | | | | | | | |
| | | | | 7 | 90 | 13 10 11 8 | 21 | | |
| 20 | | | 20.0 | | | | | | |

Bottom of borehole at 20.0 feet.

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

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Delray Beach, FL 33444
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# LOG OF BORING B04



**CLIENT** Keith and Associates, Inc
**PROJECT NAME** DC Alexander Park
**PROJECT NUMBER** 19-7566.00
**PROJECT LOCATION** SE 5th St. & A1A North, Ft. Lauderdale, FL
**DRILLING CONTRACTOR** GFA International Inc.
**HOLE DEPTH** 20 ft
**HOLE DIAMETER**
**DRILLER** Marcos Ruiz
**DATE STARTED** 3/20/20
**COMPLETED** 3/20/20
**DRILL RIG** GeoProbe 7822 DT
**GROUND WATER LEVEL:** ▽ **AT TIME OF DRILLING** 8.33 ft
**METHOD** SPT
**LATITUDE** 26.116338
**LONGITUDE** -80.10533
**NOTE:**
**HAMMER TYPE** 140# with 30 in Drop - Automatic Hammer

| DEPTH (ft) | ELEVATION (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % | BLOW COUNTS | N VALUE | MOISTURE CONTENT (%) | ORGANIC CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|
| | | | 1.0 Medium dense, tan, fine to medium grained SAND (SP) with LIMESTONE fragments. | 1 | 90 | 16 8 7 5 | 15 | | |
| | | | 2.0 Medium dense, brown, fine to medium grained SAND (SP). | | | | | | |
| | | | Loose, tan, fine to medium grained SAND (SP) with some shell fragments. | 2 | 90 | 4 4 3 4 | 7 | | |
| 5 | | | | 3 | 90 | 3 3 3 3 | 6 | | |
| | | | ▽ | 4 | 90 | 3 3 4 4 | 7 | | |
| | | | | 5 | 90 | 4 4 4 7 | 8 | | |
| 10 | | | 13.0 | | | | | | |
| | | | Tan, SHELL fragments with some sand. | 6 | 90 | 7 6 8 10 | 14 | | |
| 15 | | | | | | | | | |
| | | | | 7 | 90 | 10 13 10 11 | 23 | | |
| 20 | | | 20.0 | | | | | | |

Bottom of borehole at 20.0 feet.

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

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# LOG OF BORING B05



**CLIENT** Keith and Associates, Inc
**PROJECT NAME** DC Alexander Park
**PROJECT NUMBER** 19-7566.00
**PROJECT LOCATION** SE 5th St. & A1A North, Ft. Lauderdale, FL
**DRILLING CONTRACTOR** GFA International Inc.
**HOLE DEPTH** 20 ft
**HOLE DIAMETER**
**DRILLER** Marcos Ruiz
**DATE STARTED** 3/20/20
**COMPLETED** 3/20/20
**DRILL RIG** GeoProbe 7822 DT
**GROUND WATER LEVEL:** ▽ **AT TIME OF DRILLING** 8.25 ft
**METHOD** SPT
**LATITUDE** 26.116305
**LONGITUDE** -80.105535
**NOTE:**
**HAMMER TYPE** 140# with 30 in Drop - Automatic Hammer

| DEPTH (ft) | ELEVATION (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % | BLOW COUNTS | N VALUE | MOISTURE CONTENT (%) | ORGANIC CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|
| | | | Medium dense, tan, fine to medium grained SAND (SP) with LIMESTONE fragments. | 1 | 90 | 26 13 8 8 | 21 | | |
| 1.0 | | | Medium dense, brown, fine to medium grained SAND (SP) with trace of limestone fragments. | 2 | 90 | 6 6 8 12 | 14 | | |
| 3.0 | | | Medium dense, tan, fine to medium grained SAND (SP) with some shell fragments. | 3 | 90 | 10 10 11 12 | 21 | | |
| 5 | | | | 4 | 90 | 6 6 6 5 | 12 | | |
| | | ▽ | | 5 | 90 | 3 6 6 6 | 12 | | |
| 10 | | | | | | | | | |
| 13.0 | | | Tan, SHELL fragments with some sand. | 6 | 90 | 8 7 7 8 | 14 | | |
| 15 | | | | | | | | | |
| | | | | 7 | 90 | 8 6 9 8 | 15 | | |
| 20 | | | Bottom of borehole at 20.0 feet. | | | | | | |
| 20.0 | | | | | | | | | |

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

GFA International, Inc.
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561-395-5805

# LOG OF BORING B06



**CLIENT** Keith and Associates, Inc
**PROJECT NAME** DC Alexander Park
**PROJECT NUMBER** 19-7566.00
**PROJECT LOCATION** SE 5th St. & A1A North, Ft. Lauderdale, FL
**DRILLING CONTRACTOR** GFA International Inc.
**HOLE DEPTH** 25 ft
**HOLE DIAMETER**
**DRILLER** Marcos Ruiz
**DATE STARTED** 3/20/20
**COMPLETED** 3/20/20
**DRILL RIG** GeoProbe 7822 DT
**GROUND WATER LEVEL:** ▽ **AT TIME OF DRILLING** 10.17 ft
**METHOD** SPT
**LATITUDE** 26.116178
**LONGITUDE** -80.105044
**NOTE:**
**HAMMER TYPE** 140# with 30 in Drop - Automatic Hammer

| DEPTH (ft) | ELEVATION (ft) | GRAPHIC LOG | MATERIAL DESCRIPTION | SAMPLE TYPE NUMBER | RECOVERY % | BLOW COUNTS | N VALUE | MOISTURE CONTENT (%) | ORGANIC CONTENT (%) |
|---|---|---|---|---|---|---|---|---|---|
| | | | Loose, brown, fine to medium grained SAND (SP). | | | | | | |
| 1.0 | | | Loose, tan, fine to medium grained SAND (SP) with some shell fragments. | 1 | 90 | 2 3 3 3 | 6 | | |
| | | | | 2 | 90 | 3 3 4 4 | 7 | | |
| 5 | | | | 3 | 90 | 4 4 4 6 | 8 | | |
| | | | Medium dense, tan, fine to medium grained SAND (SP) with some shell fragments. | 4 | 90 | 6 6 6 6 | 12 | | |
| | | | | 5 | 90 | 6 8 10 13 | 18 | | |
| 10 | | | ▽ | | | | | | |
| 13.0 | | | Tan, SHELL fragments, with some sand. | 6 | 90 | 13 7 8 10 | 15 | | |
| 15 | | | | | | | | | |
| | | | | 7 | 90 | 9 8 10 16 | 18 | | |
| 20 | | | | | | | | | |
| | | | | 8 | 90 | 7 9 8 7 | 17 | | |
| 25 | | | 25.0 | | | | | | |

Bottom of borehole at 25.0 feet.

▲ SPT N VALUE ▲
20 40 60 80
PL MC LL
20 40 60 80
☐ FINES CONTENT (%) ☐
20 40 60 80

# APPENDIX B

Notes Related to Test Borings

## NOTES RELATED TO RECORDS OF TEST BORING AND GENERALIZED SUBSURFACE PROFILE

1. Groundwater level was encountered and recorded (if shown) following the completion of the soil test boring on the date indicated. Fluctuations in groundwater levels are common; consult report text for a discussion.

2. The boring location was identified and located in the field based on measured and estimated distances from existing site features.

3. The borehole was backfilled to site grade following boring completion, patched with asphalt cold patch mix when pavement was encountered.

4. The Record of Test Boring represents our interpretation of field conditions based on engineering examination of the soil samples.

5. The Record of Test Boring is subject to the limitations, conclusions, and recommendations presented in the report text.

6. The Standard Penetration Test (SPT) was performed in accordance ASTM Procedure D-1586. SPT testing procedure consists of driving a 1.4-inch I.D. split-tube sampler into the soil profile using a 140-pound hammer falling 30 inches.

7. On the Record of Test Boring listed as “Blow Counts”, the N-value is the sum of the SPT hammer blows required to drive the split-tube sampler through the second and third 6-inch increment of the sampling layer, and is an indication of soil strength.

8. Shown on the Record of Test Boring an SPT N-value expressed as 50/2” is descriptive of the fact that 50 hammer blows were required to drive the split-spoon sampler a distance of approximately 2 inches.

9. The soil/rock strata interfaces shown on the Records of Test Boring are approximate and may vary from those in the field. The soil/rock conditions shown on the Records of Test Boring refer to conditions at the specific location tested; soil/rock conditions may vary between test locations.

10. Relative density and consistency for sands/gravels, silts/clays, and limestone are described as follows:

| Cohesionless Soils | |
|---|---|
| SPT (N-Value) | Relative Density |
| 0 – 3 | Very Loose |
| 4 – 8 | Loose |
| 9 – 24 | Medium Dense |
| 25 – 40 | Dense |
| Over 40 | Very Dense |

| Silts and Clays | |
|---|---|
| SPT (N-Value) | Consistency |
| 0 – 1 | Very Soft |
| 2 – 4 | Soft |
| 4 – 6 | Firm |
| 7 – 12 | Stiff |
| 13 – 24 | Very Stiff |
| Over 24 | Hard |

| Limestone | |
|---|---|
| SPT (N-Value) | Relative Density |
| 0 – 19 | Very Soft |
| 20 – 49 | Soft |
| 50 – 100 | Medium Hard |
| 50 for 3 to 5” | Moderately Hard |
| 50 for 0 to 2” | Hard |

11. Definition of descriptive terms of modifiers for silts/clays/shells/gravels are described as follows:

| Percentage of Modifier Material | First Qualifier | Second Qualifier |
|---|---|---|
| 0 – 5 | With a Trace of + Silt, Clay, Shell | With a Trace |
| 5 – 12 | Slightly + Silty, Clayey, Shelly | With Some |
| 12 – 30 | Silty, Clayey, Shelly | With |
| 30 – 50 | Very + Silty, Clayey, Shelly | And |

12. Descriptive characteristics for organic content percentages are described as follows:

| Percentage of Organic Material | Descriptor |
|---|---|
| 0 – 5 | With a Trace |
| 5 – 20 | With Organics |
| 20 – 75 | Highly Organic |
| 75 – 100 | Peat |

# APPENDIX C

Discussion of Soil Groups

# DISCUSSION OF SOIL GROUPS

## COARSE GRAINED SOILS

**GW and SW GROUPS.** These groups comprise well-graded gravelly and sandy soils having little or no plastic fines (less than 5 percent passing the No. 200 sieve). The presence of the fines must not noticeably change the strength characteristics of the coarse-grained fraction and must not interface with it's free-draining characteristics.

**GP and SP GROUPS.** Poorly graded gravels and sands containing little of no plastic fines (less than 5 percent passing the No. 200 sieve) are classed in GP and SP groups. The materials may be called uniform gravels, uniform sands or non-uniform mixtures of very coarse material and very fine sands, with intermediate sizes lacking (sometimes called skip-graded, gap-graded or step-graded). This last group often results from borrow pit excavation in which gravel and sand layers are mixed.

**GM and SM GROUPS.** In general, the GM and SM groups comprise gravels or sands with fines (more than 12 percent passing the No. 200 sieve) having low or no plasticity. The plasticity index and liquid limit of soils in the group should plot below the "A" line on the plasticity chart. The gradation of the material is not considered significant and both well and poorly graded materials are included.

**GC and SC GROUPS.** In general, the GC and SC groups comprise gravelly or sandy soils with fines (more than 12 percent passing the No. 200 sieve), which have a fairly high plasticity. The liquid limit and plasticity index should plot above the "A" line on the plasticity chart.

## FINE GRAINED SOILS

**ML and MH GROUPS.** In these groups, the symbol M has been used to designate predominantly silty material. The symbols L and H represent low and high liquid limits, respectively, and an arbitrary dividing line between the two is set at a liquid limit of 50. The soils in the ML and MH groups are sandy silts, clayey silts or inorganic silts with relatively low plasticity. Also included are loess type soils and rock flours.

**CL and CH GROUPS.** In these groups the symbol C stands for clay, with L and H denoting low or high liquid limits, with the dividing line again set at a liquid limit of 50. The soils are primarily inorganic clays. Low plasticity clays are classified as CL and are usually lean clays, sandy clays or silty clays. The medium and high plasticity clays are classified as CH. These include the fat clays, gumbo clays and some volcanic clays.

# APPENDIX D

Hydraulic Conductivity Test Results

## HYDRAULIC CONDUCTIVITY TEST RESULTS

**Project name:** DC Alexander Park

**Project number:** 19-7566.00

**Date:** 3/19/2020

**SFWMD USUAL Open Hole Formula:**

$$K = \frac{4Q}{\pi d(2H_2^{\ 2} + 4H_2D_s + H_2d)}$$

| Exfiltration Number | First volume of water reading (after stabilization) | Final volume of water reading | Elapsed time | Average flow rate at constant head Q | Average flow rate at constant head Q*0.00223 | Perforated casing diameter or hole diameter (d) | Water table $H_2$ | Total length of bore hole | Length of bore hole below stabilized ground water (Ds) | Hydraulic Conductivity (K) |
|---|---|---|---|---|---|---|---|---|---|---|
| | gallon | gallon | min. | gallon/minute | $ft^3$/sec | ft | ft | ft | ft | $ft^3$/sec/$ft^2$ - ft of head |
| **EX-1** | 909058.9 | 909118.3 | 10 | 5.94 | 0.0132 | 0.33 | 9.0 | 10.0 | 1.0 | **2.5E-04** |
| **EX-2** | 909170.2 | 909240.0 | 10 | 6.98 | 0.0156 | 0.33 | 10.0 | 10.0 | 0.0 | **3.0E-04** |

GFA International, Inc.
1215 Wallace Drive
Delray Beach, FL 33444
561-347-0070
561-395-5805

# BORING NUMBER EX01



**CLIENT** Keith and Associates, Inc
**PROJECT NAME** DC Alexander Park
**PROJECT NUMBER** 19-7566.00
**PROJECT LOCATION** SE 5th St. & A1A North, Ft. Lauderdale, FL
**DATE STARTED** 3/19/20 **COMPLETED** 3/19/20
**LATITUDE** 26.116264 **LONGITUDE** -80.104927
**DRILLING CONTRACTOR** GFA International Inc.
**GROUND WATER LEVELS:**
**DRILLING METHOD**
**AT TIME OF DRILLING** 9.00 ft
**LOGGED BY** Marcos Ruiz **CHECKED BY** Alberto Mercado
**AT END OF** ---
**NOTES**
**AFTER DRILLING** ---

| DEPTH (ft) | SAMPLE TYPE NUMBER | GRAPHIC LOG | MATERIAL DESCRIPTION |
|---|---|---|---|
| 0.0 | | | Tan, fine to medium grained SAND (SP). |
| 2.5 | | | |
| 5.0 | | | |
| 7.5 | | | |
| 10.0 | | | Bottom of borehole at 10.0 feet. |

GENERAL BH / TP / WELL - GINT STD US.GDT - 3/20/20 17:28 - R:\GINT\19-7566.00 DC ALEXANDER PARK.GPJ

GFA International, Inc.
1215 Wallace Drive
Delray Beach, FL 33444
561-347-0070
561-395-5805

# BORING NUMBER EX02

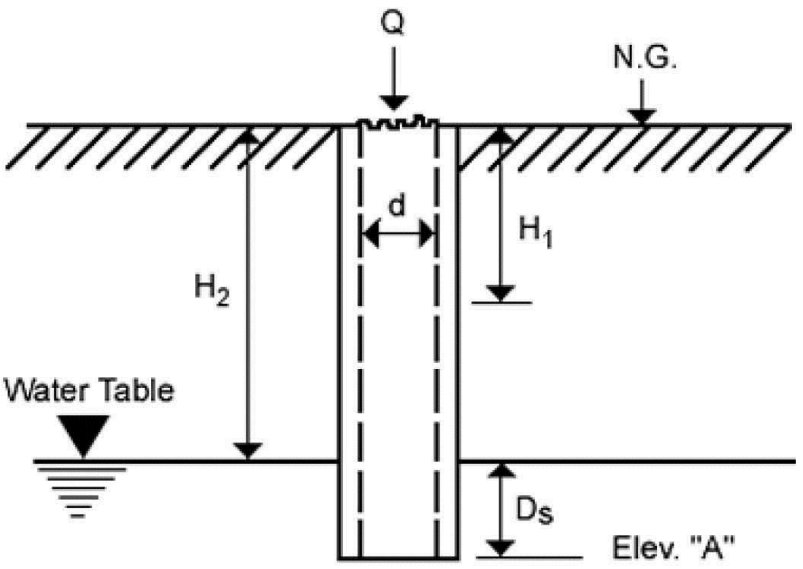


**CLIENT** Keith and Associates, Inc
**PROJECT NAME** DC Alexander Park
**PROJECT NUMBER** 19-7566.00
**PROJECT LOCATION** SE 5th St. & A1A North, Ft. Lauderdale, FL
**DATE STARTED** 3/19/20 **COMPLETED** 3/19/20
**LATITUDE** 26.116525 **LONGITUDE** -80.105151
**DRILLING CONTRACTOR** GFA International Inc.
**GROUND WATER LEVELS:**
**DRILLING METHOD**
**AT TIME OF DRILLING** 10.00 ft
**LOGGED BY** Marcos Ruiz **CHECKED BY** Alberto Mercado
**AT END OF** ---
**NOTES**
**AFTER DRILLING** ---

| DEPTH (ft) | SAMPLE TYPE NUMBER | GRAPHIC LOG | MATERIAL DESCRIPTION |
|---|---|---|---|
| 0.0 | | | Tan, fine to medium grained SAND (SP). |
| 2.5 | | | |
| 5.0 | | | |
| 7.5 | | | |
| 10.0 | | | 10.0 ▽ |
| | | | Bottom of borehole at 10.0 feet. |

GENERAL BH / TP / WELL - GINT STD US.GDT - 3/20/20 17:28 - R:\GINT\19-7566.00 DC ALEXANDER PARK.GPJ

## USUAL OPEN-HOLE TEST




$$K = \frac{4Q}{\pi d (2H_2^2 + 4H_2D_S + H_2d)}$$

K = Hydraulic Conductivity (cfs/ft.$^2$ – ft. head)

Q = "Stabilized" Flow Rate (cfs)

d = Diameter of Test Hole (feet)

$H_2$ = Depth to Water Table (feet)

$D_S$ = Saturated Hole Depth (feet)

Elev. "A" = Proposed Trench Bottom Elev. (ft. – NGVD)

$H_1$ = Average Head on Unsaturated Hole Surface (ft. head)

# APPENDIX B

SESCO – EXTERIOR LIGHTING SUBMITTAL PACKAGE

DC ALEXANDER PARK
Fort Lauderdale, Florida

**NOTE: ALL EXTERIOR LIGHTING SPECIFICATION HEREIN HAVE BEEN APPROVED THROUGH THE FLORIDA DEPARTMENT OF ENVIROMENTAL PROTECTION (FDEP) AND THE FLORIDA FISH AND WILDLIFE CONSERVATION COMMISSION (FWC) VIA A COASTAL CONSTRUCTION CONTROL LINE PERMIT (#BO-809). NO DEVIATIONS OR SUBSTITUTIONS ARE ALLOWED.**

SESCO LIGHTING

FORT LAUDERDALE, FL
LIGHTING SUBMITTAL

# DC ALEXANDER PARK

## APPENDIX B: EXTERIOR LIGHTING SPECIFICATIONS

## CITY OF FORT LAUDERDALE - PROJECT # 12373

FDEP - FWC PERMIT #: BO-809
BROWARD COUNTY ERP PERMIT LICENSE #: L2020-149

| | |
|---|---|
| PROJECT NUMBER | SQ025462 |
| ARCHITECT | KEITH |
| ENGINEER | BROOKS + SCARPA, RGD CONSULTING ENGINEERS |
| CONTRACTOR | TO BE DETERMINED |
| DISTRIBUTOR | |

SESCO Lighting | 737 Shotgun Road | Ft Lauderdale, Florida 33326
P | 954.474.9888 F | 954.474.9773
sescolighting.com

# Project: DC ALEXANDER PARK

Contents - June 1, 2021

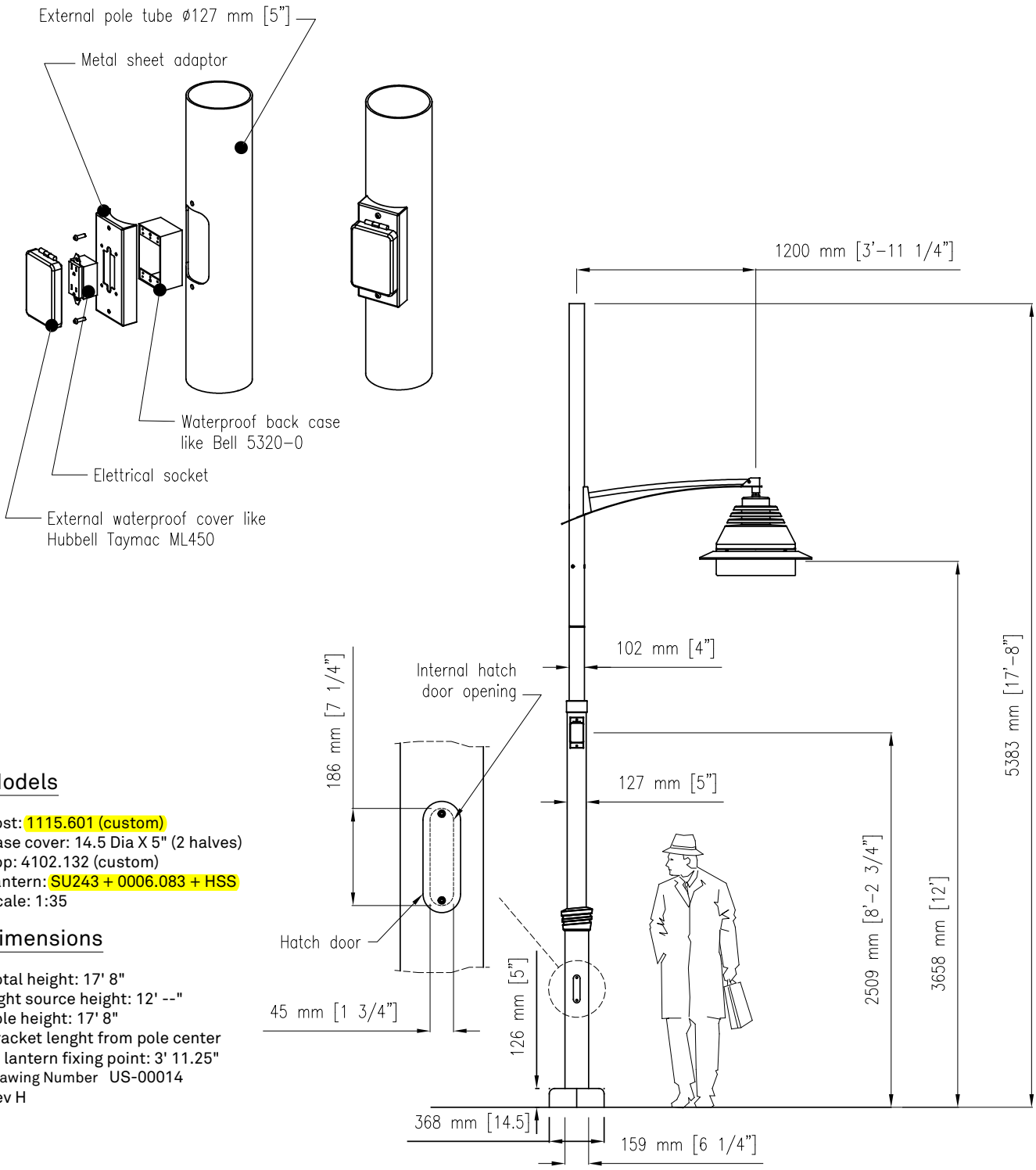
| Type | Factory | Description |
|---|---|---|
| SB | NERI | SU243L121MX02-0006.83+HSS / 1115.601 (CUSTOM) |
| SB1 | NERI | SU243L121MX02-0006.83+HSS / 1115.601 (CUSTOM) |
| SC | Neri | 2960.001-CUSTOM |
| HR | WAGNER | LULSAMB2070TA-12 |
| HRA | WAGNER | LULS30K2070TA-12 |
| L1 | Q-Tran | IQ67-AB-50-90-2.6-XX / WIDE-ST-PL-CL-S1-XX |
| L1A | Q-Tran | IQ-67-30-5-90-2.6-XX / WIDE-ST-PL-CL-S1-XX |
| L2 | WE-EF | 620-6433-MOD-AMBER-DUEL |

| Submitting Agency: | Description: | Type: |
|---|---|---|
| SESCO LIGHTING FORT LAUDERDALE 737 Shotgun Rd. Ft. Lauderdale, FL 33326 P: (954) 474-9888 F: (954) 474-9773 | SU243L121MX02-0006.83+HSS / 1115.601 (CUSTOM) | SB |
| | Project: DC ALEXANDER PARK | |
| | Notes: | |



# NERI

Custom




## Models

Post: 1115.601 (custom)
Base cover: 14.5 Dia X 5" (2 halves)
Top: 4102.132 (custom)
Lantern: SU243 + 0006.083 + HSS
Scale: 1:35

## Dimensions

Total height: 17' 8"
Light source height: 12' --"
Pole height: 17' 8"
Bracket lenght from pole center to lantern fixing point: 3' 11.25"
Drawing Number US-00014
Rev H

NERI North America Inc. - 1835 NW 112th Avenue Suite 176 Miami • FL 33172 • USA - T +1 786 315 4367 - F +1 786 257 1336 - E neri.us@neri.biz

| Submitting Agency: | Description: | Type: |
|---|---|---|
| SESCO LIGHTING FORT LAUDERDALE 737 Shotgun Rd. Ft. Lauderdale, FL 33326 P: (954) 474-9888 F: (954) 474-9773 | SU243L121MX02-0006.83+HSS / 1115.601 (CUSTOM) | SB |
| | Project: DC ALEXANDER PARK | |
| | Notes: | |



NERI

Product Contemporary

Origin of materials:
Products are made in Italy.

Cod. 1115.601 (Custom)

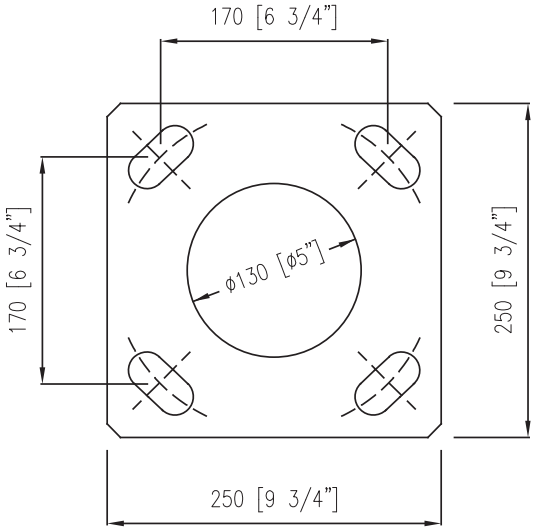
Technical Sheet

Description
Lamp-post in UNI EN 10219 steel with hot-dip galvanized coating in accordance with UNI EN ISO 1461, EN-GJL-HB 175 cast iron and UNI EN 1706 AC-46100KF cast aluminium, corresponding in shape, size and decorative moulding to the drawings which are an integral part of the specifications. The lamp-post is made up of the following elements:
hot-dip galvanized steel post (A) with circular section, made up of four tubes with the following dimensions: diam. – 6 1/4" x 4'-s 1/2"; diam. – 5"x 12'- 6 3/4"; diam.
The post is designed to be attached to a foundation plinth (P) by means of a square flange (see dimensions below) and is fitted with:

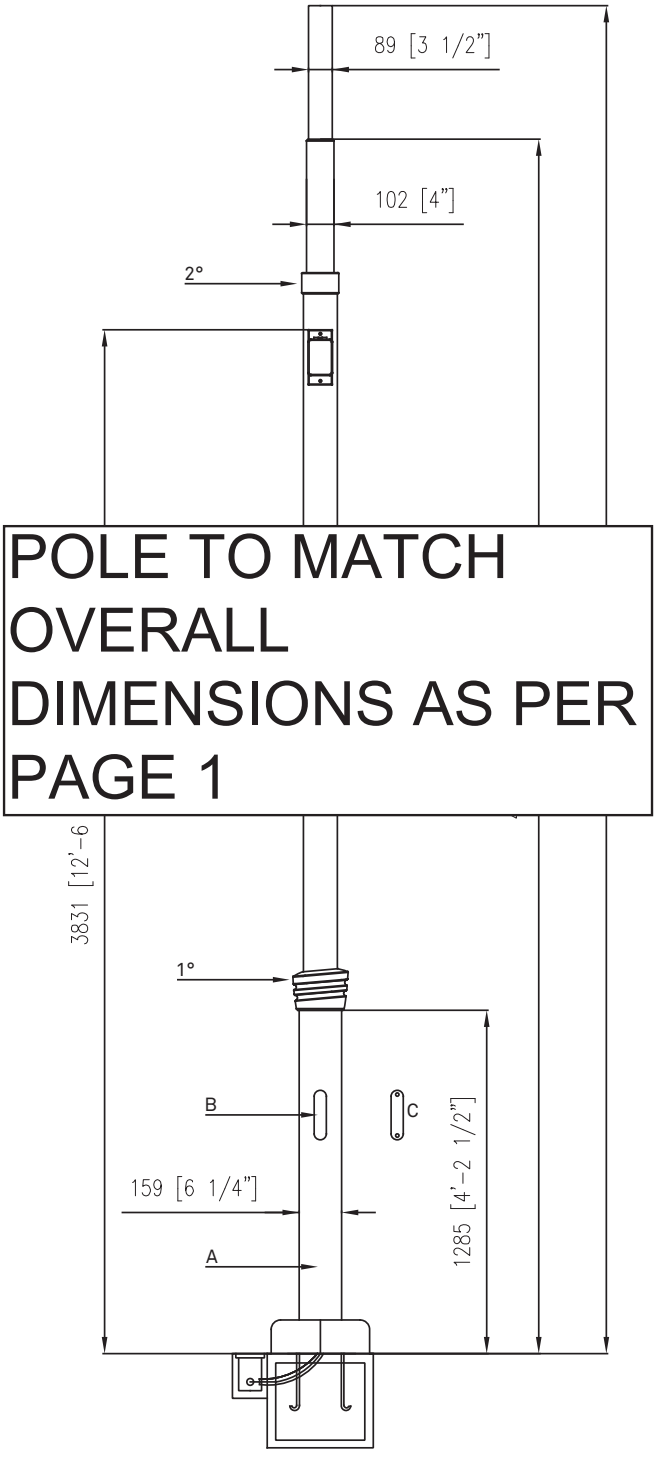
M10 earthing bush;
opening (B) (h – 7.3" x 1.8") for installation of a Class II insulation terminal board, with or without fuse ("Conchiglia" model);
die-cast aluminium panel (C) for closing the opening (B) with IP54 protection rating;
1°) cast iron decorative junctions, to be fitted where the post is tapered. Shapes and measurements as indicated in the drawing.
2°) cast aluminium decorative junctions, to be fitted where the post is tapered. Shapes and measurements as indicated in the drawing.
The overall height of the post is 16'-6 3/4".

Protection of surfaces
Please refer to the specific description of the product painting cycles.

COLOR FINISH: NERI GRAY




Flange plan
Scale 1:5



| Submitting Agency: | Description: | Type: |
|---|---|---|
| SESCO LIGHTING FORT LAUDERDALE 737 Shotgun Rd. Ft. Lauderdale, FL 33326 P: (954) 474-9888 F: (954) 474-9773 | SU243L121MX02-0006.83+HSS / 1115.601 (CUSTOM) | SB |
| | Project: DC ALEXANDER PARK | |
| | Notes: | |

NERI

www.neri.biz

ARTICLE: **4102.132** TECHNICAL DESCRIPTION - Rev. A - July 2012

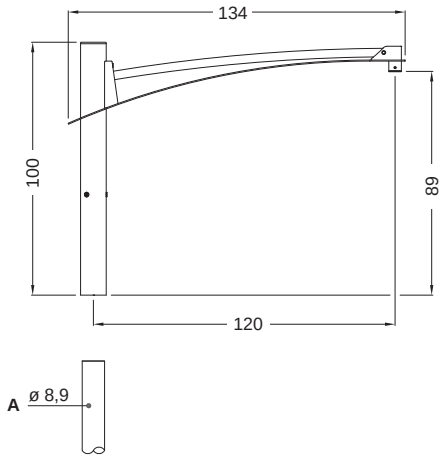
**Use**
Suitable support for one suspended light fixture

**Materials**
Made from S235J UNI EN 10219 and 10025 steel with hot-dip galvanized coating in accordance with UNI EN ISO 1461.

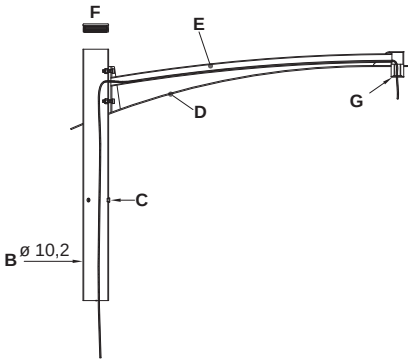
**Protection of surfaces**
Please refer to the specific description of the product painting cycles

**Dimensions and weight**
Height 100 cm; width 134 cm; usable protrusion 120 cm
Weight 16 Kg.

**Description**
The top section is made up of the following elements:
support element, 100 cm in height, made from steel pipe (B) (diam. 10.2 cm) for attachment onto posts with 8.9 cm diameter (A), supplied with three stainless steel M10 screws for bolting the element to the post (C) and plastic end cap (F);
curved arm made from steel pipe (E - diam. 3.3 cm), fixed with two M12 stainless steels stop nuts to the vertical pipe for attachment onto the post (B). A cylindrical element with a 3/4" GAS (G) coupling is welded to the end section of the arm for attachment of the light fixture;
steel sheet (D - thickness 0.4 cm), welded to the arm (E).




Side view




Section

**NB:** Measures in cm.

| Submitting Agency: | Description: | Type: |
|---|---|---|
| SESCO LIGHTING<br>FORT LAUDERDALE<br>737 Shotgun Rd.<br>Ft. Lauderdale, FL 33326<br>P: (954) 474-9888<br>F: (954) 474-9773 | **SU243L121MX02-0006.83+HSS / 1115.601 (CUSTOM)**<br>Project: **DC ALEXANDER PARK**<br>Notes: | **SB** |



# NERI

| | | | |
|---|---|---|---|
| Project location: | | | |
| Project name: | | | |
| Model code #: | | Date | |

| Fixture type: |
|---|
| |

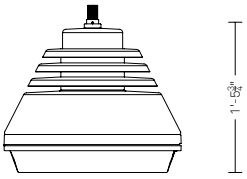
nerinorthamerica.com

DESCRIPTION:
Circular light fixture in die-cast and sheet aluminium, with rapid coupling for suspended mounting. The lower frame is tilting for access to auxiliary and optic compartment and the electrical components are mounted on easily removable plate. Optical system in a single-piece molded in UV resistant polycarbonate, with large refractive lenses for glare minimizing. Light source with LED module (power led's), coupled to an internal large heat sink in aluminium for optimal control of temperature and self regulating power rated for a operative life of over 80,000 hours (15 years). The Light 23, requires low-maintenance thank to IP66 protection rating and to Leds lighting sources.
Thank to optic system geometry, is ideally for lighting of urban streets and major roads. The suggested height of installation from 16' to 30'.

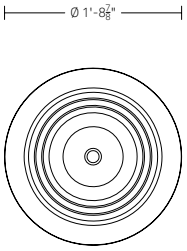
## LIGHT 24 - serie 243 WHITE AND AMBER LEDs

**LED Source - Cperformance range**
**Voltage = 120-277, 50/60 Hz**

EPA = 0.82 ft²
Weight = 30.86 lb (14.0 Kg)
Height (H) = 1' - 5 3/4" (450 mm)
Diameter (D) = 1' - 8 7/8" (530 mm)



Front view



Plan view

Compliance:
UL Standard 1598 CSA C22.2 no.250.0-8

**MODEL:**
code sample: SU243L123M402

| Mounting | Series | Optic system | CCT | Lumen output | Driver function |
|---|---|---|---|---|---|
| **SU** = Suspended | **243L** = Light 24 LED - serie 243 | **11** = type II Short<br>**12** = type III Very Short | **1** = 3,000K<br>**8** = AMBER LED | **MX** = 4,500 lm<br>**M3** = 7,500 lm<br>**M4** = 9,000 lm<br>**M5** = 10,500 lm<br>**M6** = 12,000 lm * | **02** = 1-10V + NCL<br>**06** = DALI + NCL<br>**14** = 6 hours. aut. flux red. + NCL<br>71 = Manual dimming |

## COLOR FINISH: NERI GRAY

SPECIFICATIONS:

Construction:
- Upper frame in aluminum.
- Lower frame ring in aluminum for the support of optic system and for the Led module, hinged to upper frame and secured with two flexible clips in stainless steel.
- Suitable for wet location (IP 66)."

Materials:
- Die-cast aluminium (ASTM B179-82)
- Sheet aluminium
- Hot galvanized steel
- Brass (rapid coupling)
- Stainless steel screws.

Finish:
- Standard colour is dark grey NERI type.
- Information about paint steps used on this product in specific technical sheet.

Fastening:
- Suspended installation with threaded tube (G 3/4" -UNI 338;ISO 228/1).

Operation and maintenance:
- Follow the instructions for operation and maintenance.
- No maintenance is required, except a periodic cleaning of the screen from dust.

TECHNICAL DATA:

Electrical:
- Compliance: UL Standard 1598 - CSA C22,2 no.250.0.
- Voltage: 120-277V (Universal).
- Rated power: from 57W to 136W.
- Frequency: 50/60Hz.
- Protection rating:IP66
- Operating temp.:-22F° + 104°F (-30C° + 40°C).
- Electronic ballast with self-diagnostic function and monitoring for over temperatures.
- Estimated life: B10 at 80,000 hours.

Optical Features:
- Light source: power leds.
- Lumen output:from 4.500 to 12.000 lm
- Colour temperature: 3.000K and AMBER
- Chromatic Rendering Index: CRI>70.
- Estimated life: 80.000 hours (L85 - Ta 25°C).
- Protection rating:IP66 (Optic).
- Heat sink in aluminium extruded for a optimal control of temperature with electronic sensor on LED plate for the control of over temperaures.
- Refractive lens in PC ( UV resistant ).
- IES classification: cat off.
- Shock resistance of screen:IK10.

CONFIGURATION TABLES:

Configuration tables of luminous fluxes.
The efficacy (lm/W) on table refers to the complete system.

| 3,000 K - Colour temperature | | | |
|---|---|---|---|
| **Code** | lm output | Watt | lm/W |
| **1MX** | 4,500 | 61 | 73 |
| **1M3** | 7,500 | 79 | 95 |
| **1M4** | 9,000 | 100 | 90 |
| **1M5** | 10,500 | 124 | 85 |

| 4,000 K - Colour temperature | | | |
|---|---|---|---|
| **Code** | lm output | Watt | lm/W |
| **3MX** | 4500 | - | - |
| **3M3** | 7,500 | 73 | 103 |
| **3M4** | 9,000 | 92 | 98 |
| **3M5** | 10,500 | 113 | 93 |
| **3M6** | 12,000 | 136 | 88 |

Configuration of driver functions

| Code | Driver function |
|---|---|
| **02** | 1-10V control + constant flux control (1-10V + NCL) |
| **06** | DALI control + constant flux control (DALI + NCL) |
| **14** | 6 hours aut. flux reduction -30% + constant flux control (6H NVL + NCL) |
| **71** | Optional: Internal manual dimming control allowing up to 50% light reduction. Setup by qualified operator and with powerline disconnected. |

Notes:
- (*) Lumen output M6, available only with colour temperature of 4,000K.
- NCL= (Neri Constant Lumen) control for maintenance is standard with all driver functions.

ACCESSORIES:
- Adherent decorative ring (Ø 750 mm) in sheet aluminum (code 0006.083)

- Distanced decorative ring (Ø 750 mm) in sheet aluminum (code 0006.082)

HSS: 4" HOUS SIDE SHIELD