

Solicitation 18-65-I

Main, Mill & Charles Street Paving, Drainage, Landscape and Signalization

Bid Designation: Public

City of Lewisville, Texas

Bid 18-65-I**Main, Mill & Charles Street Paving, Drainage, Landscape and Signalization**

Bid Number	18-65-I
Bid Title	Main, Mill & Charles Street Paving, Drainage, Landscape and Signalization
Bid Start Date	In Held
Bid End Date	Sep 20, 2018 2:00:00 PM CDT
Question & Answer End Date	Sep 13, 2018 2:00:00 PM CDT
Bid Contact	Tracey Ogurek Buyer Finance
Contract Duration	540 days
Contract Renewal	Not Applicable
Prices Good for	90 days
Pre-Bid Conference	Sep 11, 2018 3:00:00 PM CDT Attendance is optional Location: City of Lewisville 151 W. Church Street Lewisville, TX 75057 Community Development Conference Room 2nd Floor
Standard Disclaimer	All goods and services provided to the City must be compliant with the Americans with Disabilities Act ("ADA") and all regulations promulgated pursuant to the ADA. The successful bidder will be required to certify compliance, if applicable.
Bid Comments	The City of Lewisville is accepting bids for Main Street, Mill Street and Charles Street Paving, Drainage, Landscape, and Signalization Improvements. Basis of award will be lowest responsible bidder. Bidders are required to submit a cashier's or certified check issued by a bank satisfactory to the City of Lewisville, or a Bid Bond (with proper Power of Attorney) from a surety licensed to do business in the State of Texas, payable without recourse to the City of Lewisville, in an amount not less than five (5%) percent of the total amount of the base bid submitted to insure that the successful bidder will enter into a contract and execute all necessary bonds within fifteen (15) days after notice of award of the contract to him. The bid security must be uploaded with bid documents to Bidsync or included within bid envelope along with the bid sheet for the bidder to be considered responsive. The successful bidder will be required to furnish performance, payment and maintenance bonds as described in the specifications. All documents that require a signature are to be signed and uploaded to Bidsync, or provided within vendor's bid if delivered to the City of Lewisville. The successful bidder shall begin work under this contract within 15 days after receiving notice to proceed. All insurance certificates and bonds are to be provided and approved by the City prior to commencement of any work. The completion of work, including clean-up, shall be completed 540 calendar days from notice to proceed. Item Response

Item Response Form

Item **18-65-I--01-01 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Start-Up**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **1 lump sum**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 1

Description

(Mobilization, Bonds, Insurance, Move-In, Sanitary Facilities, etc.) Note: This item may not exceed 5% of the Sub Total Bid Amount.

Item **18-65-I--01-02 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Traffic Control**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **1 lump sum**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 1

Description

(Including Barriers, Barricades, Detour Signs, Removable Pavement Markings, Temporary Traffic Control, etc.)

Item **18-65-I--01-03 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Erosion Control (SWPPP) and Removal**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **1 lump sum**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 1

Description

Item **18-65-I--01-04 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Prepare Right-of-Way**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **54 each**
 Unit Price
 Delivery Location **City of Lewisville, Texas**

No Location Specified

None

Lewisville TX 75057

Qty 54

Description

Item **18-65-I--01-05 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Remove and Dispose of Existing Asphalt Pavement**

Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**

Quantity **6582 square yard**

Unit Price

Delivery Location **City of Lewisville, Texas**

No Location Specified

None

Lewisville TX 75057

Qty 6582

Description

Varying Thickness

Item **18-65-I--01-06 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Remove and Dispose of Existing Concrete Pavement**

Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**

Quantity **15079 square yard**

Unit Price

Delivery Location **City of Lewisville, Texas**

No Location Specified

None

Lewisville TX 75057

Qty 15079

Description

Varying Thickness

Item **18-65-I--01-07 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Remove and Dispose of Structure (Retaining Wall)**

Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**

Quantity **92 linear foot**

Unit Price

Delivery Location **City of Lewisville, Texas**

No Location Specified

None

Lewisville TX 75057

Qty 92

Description

Item **18-65-I--01-08 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Remove Existing Concrete Median**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **1136 square yard**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 1136

Description
 Variable Depth

Item **18-65-I--01-09 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Remove Existing Concrete Sidewalks**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **3413 square yard**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 3413

Description

Item **18-65-I--01-10 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Remove Existing Concrete Flume**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **2 square yard**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 2

Description

Item **18-65-I--01-11 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Remove and Dispose of Block Wall**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **4 linear foot**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified

None
Lewisville TX 75057
Qty 4

Description

Item **18-65-I--01-12 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Remove and Dispose of Existing Brick Wall**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **207 linear foot**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 207

Description

At the northwest corner and southwest corner of the Main St & Mill St intersection

Item **18-65-I--01-13 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Remove and Relocate Existing Chainlink Security Fence & Gate**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **172 linear foot**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 172

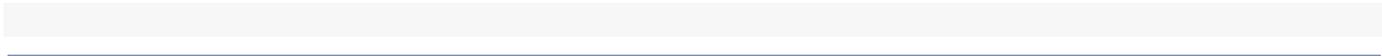
Description

Item **18-65-I--01-14 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Remove and Dispose of Sign Foundation**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **2 square yard**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 2

Description

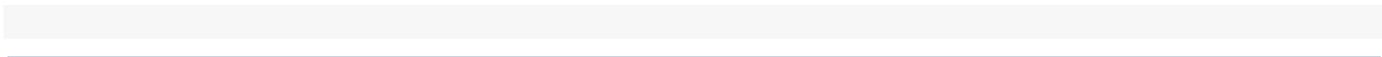
Item **18-65-I--01-15 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Remove & Salvage Sign**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **17 each**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
Qty 17

Description



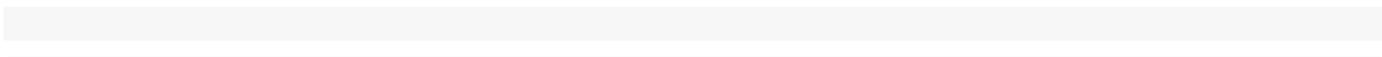
Item **18-65-I--01-16 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Remove and Dispose of Bollard**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **3 each**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
Qty 3

Description



Item **18-65-I--01-17 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Remove & Relocate Mailbox**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **5 each**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
Qty 5

Description



Item **18-65-I--01-18 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Remove and Relocate Electric Riser and Meter Base**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **1 each**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified

None
Lewisville TX 75057
Qty 1

Description

Item **18-65-I--01-19 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Excavation (Roadway)**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **3200 cubic yard**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 3200

Description

Item **18-65-I--01-20 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Embankment**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **1200 cubic yard**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 1200

Description

Item **18-65-I--01-21 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Hydrated Lime Slurry (8%)**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **128 ton**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 128

Description

Item **18-65-I--01-22 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Lime Treatment (Existing Material) (8-inch)**

Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **5330 square yard**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 5330

Description

Item **18-65-I--01-23 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Concrete Pavement (Jointed - CPCD) (8-inch)**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **2710 square yard**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 2710

Description

Item **18-65-I--01-24 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Concrete Pavement HES (High Early Strength) (Jointed - CPCD) (8-inch)**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **1880 square yard**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 1880

Description

Item **18-65-I--01-25 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Concrete Pavement (Cont Reinf - CRCP) (11-inch)**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **4955 square yard**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 4955

Description

Item **18-65-I--01-26 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Concrete Pavement HES (High Early Strength) (Cont Reinf - CRCP) (11-inch)**

Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**

Quantity **2030 square yard**

Unit Price

Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 2030

Description

Item **18-65-I--01-27 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Concrete Coloring**

Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**

Quantity **1350 square yard**

Unit Price

Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 1350

Description

Item **18-65-I--01-28 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Driveways (Concrete)**

Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**

Quantity **2953 square yard**

Unit Price

Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 2953

Description

Item **18-65-I--01-29 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Install 4-inch Thick Concrete Sidewalks**

Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**

Quantity **200 square yard**

Unit Price

Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 200

Description

Item **18-65-I--01-30 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Install Retaining Wall (City Standard)**

Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**

Quantity **68 linear foot**

Unit Price

Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 68

Description

Item **18-65-I--01-31 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Install Cellular Lightweight Concrete Retaining Wall**

Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**

Quantity **11 cubic yard**

Unit Price

Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 11

Description

Item **18-65-I--01-32 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: D-GR HMA (SQ) TY-B PG64-22 (6-inch)**

Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**

Quantity **1445 ton**

Unit Price

Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 1445

Description

Item **18-65-I--01-33 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: D-GR HMA (SQ) TY-B PG64-22 (4-inch)**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **11 ton**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 11

Description

Item **18-65-I--01-34 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: D-GR HMA (SQ) TY-D SAC-B PG64-22 (2-inch)**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **6 ton**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 6

Description

Item **18-65-I--01-35 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Barrier Free Curb Ramps with Truncated Domes**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **92 each**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 92

Description

Item **18-65-I--01-36 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Trench Safety**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **745 linear foot**
 Unit Price
 Delivery Location **City of Lewisville, Texas**

No Location Specified

None

Lewisville TX 75057

Qty 745

Description

Item **18-65-I--01-37 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Install 18-Inch Class III RC Pipe**

Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**

Quantity **416 linear foot**

Unit Price

Delivery Location **City of Lewisville, Texas**

No Location Specified

None

Lewisville TX 75057

Qty 416

Description

Item **18-65-I--01-38 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Install 21-Inch Class III RC Pipe**

Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**

Quantity **245 linear foot**

Unit Price

Delivery Location **City of Lewisville, Texas**

No Location Specified

None

Lewisville TX 75057

Qty 245

Description

Item **18-65-I--01-39 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Install 24-Inch Class III RC Pipe**

Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**

Quantity **25 linear foot**

Unit Price

Delivery Location **City of Lewisville, Texas**

No Location Specified

None

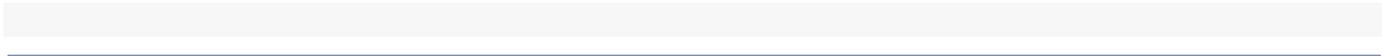
Lewisville TX 75057

Qty 25

Description

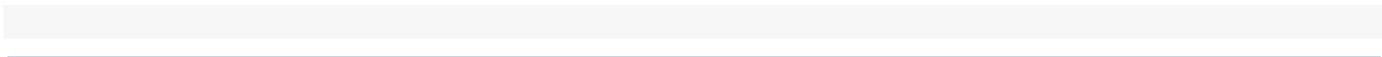
Item **18-65-I--01-40 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Install 27-Inch Class III RC Pipe**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **25 linear foot**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
Qty 25

Description



Item **18-65-I--01-41 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Install 33-Inch Class III RC Pipe**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **20 linear foot**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
Qty 20

Description



Item **18-65-I--01-42 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Install 36-Inch Class III RC Pipe**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **30 linear foot**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
Qty 30

Description



Item **18-65-I--01-43 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Install Storm Drain Manhole 3-foot x 3-foot**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **2 each**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified

None
Lewisville TX 75057
Qty 2

Description



Item **18-65-I--01-44 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Install Storm Drain Manhole 3-inch x 6-inch**

Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**

Quantity **1 each**

Unit Price

Delivery Location **City of Lewisville, Texas**

No Location Specified

None

Lewisville TX 75057

Qty 1

Description



Item **18-65-I--01-45 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Install 5-foot Curb Inlet**

Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**

Quantity **4 each**

Unit Price

Delivery Location **City of Lewisville, Texas**

No Location Specified

None

Lewisville TX 75057

Qty 4

Description



Item **18-65-I--01-46 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Install 5-foot Recessed Curb Inlet**

Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**

Quantity **5 each**

Unit Price

Delivery Location **City of Lewisville, Texas**

No Location Specified

None

Lewisville TX 75057

Qty 5

Description



Item **18-65-I--01-47 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Install 10-foot Curb Inlet**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **14 each**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
Qty 14

Description

Item **18-65-I--01-48 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Install Three Grate Combination Inlet**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **7 each**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
Qty 7

Description

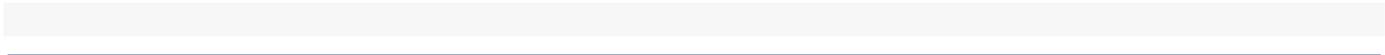
Item **18-65-I--01-49 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Install Four Grate Combination Inlet**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **5 each**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
Qty 5

Description

Item **18-65-I--01-50 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Install 15-foot TxDOT PCO Inlet**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **2 each**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified

None
Lewisville TX 75057
Qty 2

Description



Item **18-65-I--01-51 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Install 5-foot TxDOT PCU Inlet**

Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**

Quantity **2 each**

Unit Price

Delivery Location **City of Lewisville, Texas**

No Location Specified

None

Lewisville TX 75057

Qty 2

Description



Item **18-65-I--01-52 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Adjusting Manholes to Grade**

Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**

Quantity **13 each**

Unit Price

Delivery Location **City of Lewisville, Texas**

No Location Specified

None

Lewisville TX 75057

Qty 13

Description



Item **18-65-I--01-53 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Adjusting Water Valves to Grade**

Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**

Quantity **22 each**

Unit Price

Delivery Location **City of Lewisville, Texas**

No Location Specified

None

Lewisville TX 75057

Qty 22

Description



Item **18-65-I--01-54 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Adjusting Water Meter to Grade**

Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**

Quantity **2 each**

Unit Price

Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
Qty 2

Description



Item **18-65-I--01-55 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Adjusting S.S. Cleanout to Grade**

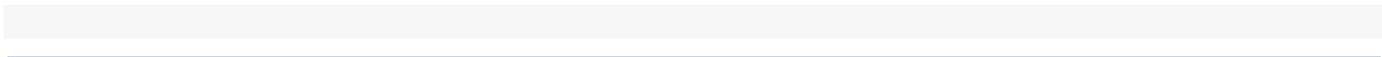
Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**

Quantity **1 each**

Unit Price

Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
Qty 1

Description



Item **18-65-I--01-56 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Remove and Dispose of Structure (Slotted Drain Inlet)**

Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**

Quantity **40 linear foot**

Unit Price

Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
Qty 40

Description



Item **18-65-I--01-57 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Remove and Dispose of Structure (Existing Storm Drain Inlet)**

Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**

Quantity **31 each**

Unit Price

Delivery Location **City of Lewisville, Texas**
No Location Specified

None
Lewisville TX 75057
Qty 31

Description



Item **18-65-I--01-58 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Remove and Dispose of Structure (Pipe)**
Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
Quantity **460 linear foot**
Unit Price
Delivery Location **City of Lewisville, Texas**
No Location Specified
None
Lewisville TX 75057
Qty 460

Description



Item **18-65-I--01-59 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Remove and Relocate Private Sign (Electrical)**
Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
Quantity **1 each**
Unit Price
Delivery Location **City of Lewisville, Texas**
No Location Specified
None
Lewisville TX 75057
Qty 1

Description



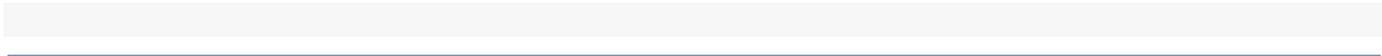
Item **18-65-I--01-60 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Remove Private Sign (Electrical)**
Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
Quantity **1 each**
Unit Price
Delivery Location **City of Lewisville, Texas**
No Location Specified
None
Lewisville TX 75057
Qty 1

Description



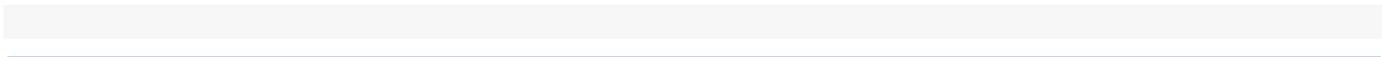
Item **18-65-I--01-61 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Pavement Markings and Signing**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **1 lump sum**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 1

Description



Item **18-65-I--01-62 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Install Wheel Stops at Angle Parking Spaces**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **54 each**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 54

Description



Item **18-65-I--01-63 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Rectangular Rapid Flashing Beacon**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **6 each**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 6

Description

Solar Powered, pushbutton activated RRFB



Item **18-65-I--01-64 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Install Fire Hydrant W/ 6-inch Valve & Box Assembly**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **2 each**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified

None
Lewisville TX 75057
Qty 2

Description

Item **18-65-I--01-65 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Remove and Salvage Fire Hydrant Assembly**

Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**

Quantity **2 each**

Unit Price

Delivery Location **City of Lewisville, Texas**

No Location Specified

None

Lewisville TX 75057

Qty 2

Description

Item **18-65-I--01-66 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Install Over-the-Street Banner Poles**

Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**

Quantity **1 lump sum**

Unit Price

Delivery Location **City of Lewisville, Texas**

No Location Specified

None

Lewisville TX 75057

Qty 1

Description

Two 30-foot tall poles painted black, 36-inch drill shaft, 3/8-inch steel banner cables and attachments

Item **18-65-I--01-67 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Traffic Signal Improvements at Mill St & Main St Intersection**

Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**

Quantity **1 lump sum**

Unit Price

Delivery Location **City of Lewisville, Texas**

No Location Specified

None

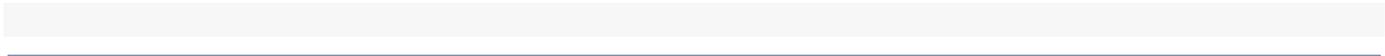
Lewisville TX 75057

Qty 1

Description

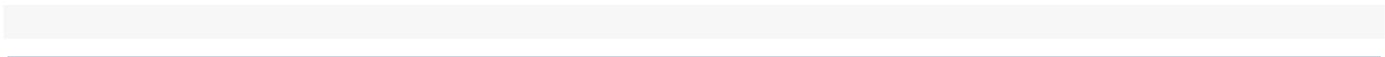
Item **18-65-I--01-68 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Traffic Signal Improvements at Mill St & Purnell St Intersection**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **1 lump sum**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 1

Description



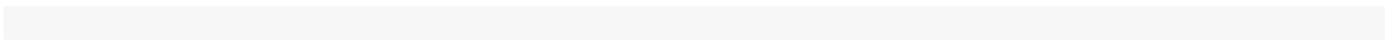
Item **18-65-I--01-69 - Main Street & Mill Street - Roadway, Utilities & Traffic Signals: Traffic Signal Improvements at Mill St & Church St Intersection**
 Lot Description **Main Street & Mill Street - Roadway, Utilities & Traffic Signals**
 Quantity **1 lump sum**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 1

Description



Item **18-65-I--02-01 - Main Street & Mill Street - Landscape: Tree Protection**
 Lot Description **Main Street & Mill Street - Landscape**
 Quantity **400 linear foot**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 400

Description



Item **18-65-I--02-02 - Main Street & Mill Street - Landscape: Tree/Shrub Removal**
 Lot Description **Main Street & Mill Street - Landscape**
 Quantity **1 lump sum**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057

Qty 1

Description

Item **18-65-I--02-03 - Main Street & Mill Street - Landscape: Concrete Paving Type 1 (Brush Broom Finish)**
 Lot Description **Main Street & Mill Street - Landscape**
 Quantity **5335 square yard**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 5335

Description

Item **18-65-I--02-04 - Main Street & Mill Street - Landscape: Concrete Paving Type 1 (Sand Blasted Finish)**
 Lot Description **Main Street & Mill Street - Landscape**
 Quantity **19 square yard**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 19

Description

Item **18-65-I--02-05 - Main Street & Mill Street - Landscape: Decomposed Granite Gravel**
 Lot Description **Main Street & Mill Street - Landscape**
 Quantity **5 cubic yard**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 5

Description

With a binder/stabilizer

Item **18-65-I--02-06 - Main Street & Mill Street - Landscape: Concrete Step Pads**
 Lot Description **Main Street & Mill Street - Landscape**
 Quantity **215 each**
 Unit Price

Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 215

Description

Item **18-65-I--02-07 - Main Street & Mill Street - Landscape: Concrete Step Pads in Rain Garden**
 Lot Description **Main Street & Mill Street - Landscape**
 Quantity **49 each**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 49

Description

Item **18-65-I--02-08 - Main Street & Mill Street - Landscape: Paver Type 1**
 Lot Description **Main Street & Mill Street - Landscape**
 Quantity **6385 square foot**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 6385

Description

Item **18-65-I--02-09 - Main Street & Mill Street - Landscape: Concrete Step Risers**
 Lot Description **Main Street & Mill Street - Landscape**
 Quantity **63 linear foot**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 63

Description

Item **18-65-I--02-10 - Main Street & Mill Street - Landscape: Landscape Curb**
 Lot Description **Main Street & Mill Street - Landscape**

Quantity **700 linear foot**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
Qty 700

Description



Item **18-65-I--02-11 - Main Street & Mill Street - Landscape: Wall Type 1 (Retaining Wall)**
 Lot Description **Main Street & Mill Street - Landscape**
 Quantity **270 linear foot**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
Qty 270

Description



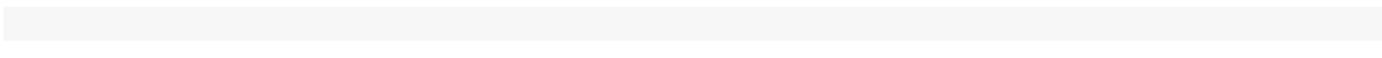
Item **18-65-I--02-12 - Main Street & Mill Street - Landscape: Wall Type 2**
 Lot Description **Main Street & Mill Street - Landscape**
 Quantity **110 linear foot**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
Qty 110

Description



Item **18-65-I--02-13 - Main Street & Mill Street - Landscape: Bench**
 Lot Description **Main Street & Mill Street - Landscape**
 Quantity **8 each**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
Qty 8

Description



Item **18-65-I--02-14 - Main Street & Mill Street - Landscape: Trash Bin**
 Lot Description **Main Street & Mill Street - Landscape**
 Quantity **18 each**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
Qty 18

Description

Item **18-65-I--02-15 - Main Street & Mill Street - Landscape: Recycle Bin**
 Lot Description **Main Street & Mill Street - Landscape**
 Quantity **17 each**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
Qty 17

Description

Item **18-65-I--02-16 - Main Street & Mill Street - Landscape: Bike Rack**
 Lot Description **Main Street & Mill Street - Landscape**
 Quantity **3 each**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
Qty 3

Description

Item **18-65-I--02-17 - Main Street & Mill Street - Landscape: Railing Type 1**
 Lot Description **Main Street & Mill Street - Landscape**
 Quantity **70 linear foot**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
Qty 70

Description

Item **18-65-I--02-18 - Main Street & Mill Street - Landscape: Railing Type 2**
 Lot Description **Main Street & Mill Street - Landscape**
 Quantity **140 linear foot**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 140

Description

Item **18-65-I--02-19 - Main Street & Mill Street - Landscape: Rain Garden Crossings**
 Lot Description **Main Street & Mill Street - Landscape**
 Quantity **5 each**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 5

Description

Item **18-65-I--02-20 - Main Street & Mill Street - Landscape: 2-inch - 4-inch Cibolo River Rock**
 Lot Description **Main Street & Mill Street - Landscape**
 Quantity **25 cubic yard**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 25

Description

Item **18-65-I--02-21 - Main Street & Mill Street - Landscape: Landscaping**
 Lot Description **Main Street & Mill Street - Landscape**
 Quantity **1 lump sum**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None

Lewisville TX 75057

Qty 1

Description

(Trees, Shrubs, Perennials, Groundcover, Turf, Seedmix, Mulch, Planting Soils, Berm Soils, Steel Edging, Root Barrier etc.)

Item **18-65-I--02-22 - Main Street & Mill Street - Landscape: Irrigation**

Lot Description **Main Street & Mill Street - Landscape**

Quantity **1 lump sum**

Unit Price

Delivery Location **City of Lewisville, Texas**

No Location Specified

None

Lewisville TX 75057

Qty 1

Description

Item **18-65-I--03-01 - Main Street & Mill Street - Lighting: Lighting**

Lot Description **Main Street & Mill Street - Lighting**

Quantity **1 lump sum**

Unit Price

Delivery Location **City of Lewisville, Texas**

No Location Specified

None

Lewisville TX 75057

Qty 1

Description

Including Equipment Rack, Main Breaker, Surge Protection Device (SPD), Meter & Pedestal, Light Fixtures, Poles, Receptacles & Receptacle Transformers, Bulbs, Piers, Conduit & Cable, Fiber Optic Conduits (same trench as lighting), Large Handholes (1 Electrical and 1 Fiber), Small Lighting Handholes and Fiber Optic Handholes

Item **18-65-I--04-01 - Charles Street - Roadway, Utilities & Traffic Signals: Mobilization (5%)**

Lot Description **Charles Street - Roadway, Utilities & Traffic Signals**

Quantity **1 lump sum**

Unit Price

Delivery Location **City of Lewisville, Texas**

No Location Specified

None

Lewisville TX 75057

Qty 1

Description

Item **18-65-I--04-02 - Charles Street - Roadway, Utilities & Traffic Signals: Traffic Control**

Lot Description **Charles Street - Roadway, Utilities & Traffic Signals**

Quantity **1 lump sum**

Unit Price

Delivery Location **City of Lewisville, Texas**
No Location Specified
None
Lewisville TX 75057
Qty 1

Description

(Including Barriers, Barricades, Detour Signs, Removable Pavement Markings, Temporary Traffic Control, etc.)

Item **18-65-I--04-03 - Charles Street - Roadway, Utilities & Traffic Signals: Erosion Control (SWPPP) and Removal**

Lot Description **Charles Street - Roadway, Utilities & Traffic Signals**

Quantity **1 lump sum**

Unit Price

Delivery Location **City of Lewisville, Texas**
No Location Specified
None
Lewisville TX 75057
Qty 1

Description

Item **18-65-I--04-04 - Charles Street - Roadway, Utilities & Traffic Signals: Remove Asphalt Pavement**

Lot Description **Charles Street - Roadway, Utilities & Traffic Signals**

Quantity **32 square yard**

Unit Price

Delivery Location **City of Lewisville, Texas**
No Location Specified
None
Lewisville TX 75057
Qty 32

Description

Item **18-65-I--04-05 - Charles Street - Roadway, Utilities & Traffic Signals: Remove Concrete Pavement**

Lot Description **Charles Street - Roadway, Utilities & Traffic Signals**

Quantity **1143 square yard**

Unit Price

Delivery Location **City of Lewisville, Texas**
No Location Specified
None
Lewisville TX 75057
Qty 1143

Description

Item **18-65-I--04-06 - Charles Street - Roadway, Utilities & Traffic Signals: Remove Concrete Sidewalk**

Lot Description **Charles Street - Roadway, Utilities & Traffic Signals**

Quantity **191 square yard**

Unit Price

Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 191

Description

Item **18-65-I--04-07 - Charles Street - Roadway, Utilities & Traffic Signals: Remove Concrete Pavers**

Lot Description **Charles Street - Roadway, Utilities & Traffic Signals**

Quantity **17 square yard**

Unit Price

Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 17

Description

Item **18-65-I--04-08 - Charles Street - Roadway, Utilities & Traffic Signals: Adjust Manholes to Grade**

Lot Description **Charles Street - Roadway, Utilities & Traffic Signals**

Quantity **2 each**

Unit Price

Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 2

Description

Item **18-65-I--04-09 - Charles Street - Roadway, Utilities & Traffic Signals: Adjust Water Valves to Grade**

Lot Description **Charles Street - Roadway, Utilities & Traffic Signals**

Quantity **3 each**

Unit Price

Delivery Location **City of Lewisville, Texas**

No Location Specified

None

Lewisville TX 75057

Qty 3

Description

Item **18-65-I--04-10 - Charles Street - Roadway, Utilities & Traffic Signals: Remove Structure (Inlet)**

Lot Description **Charles Street - Roadway, Utilities & Traffic Signals**

Quantity **3 each**

Unit Price

Delivery Location **City of Lewisville, Texas**

No Location Specified

None

Lewisville TX 75057

Qty 3

Description

Item **18-65-I--04-11 - Charles Street - Roadway, Utilities & Traffic Signals: Remove Structure (Pipe)**

Lot Description **Charles Street - Roadway, Utilities & Traffic Signals**

Quantity **28 linear foot**

Unit Price

Delivery Location **City of Lewisville, Texas**

No Location Specified

None

Lewisville TX 75057

Qty 28

Description

Item **18-65-I--04-12 - Charles Street - Roadway, Utilities & Traffic Signals: Hydrated Lime Slurry**

Lot Description **Charles Street - Roadway, Utilities & Traffic Signals**

Quantity **124 ton**

Unit Price

Delivery Location **City of Lewisville, Texas**

No Location Specified

None

Lewisville TX 75057

Qty 124

Description

Item **18-65-I--04-13 - Charles Street - Roadway, Utilities & Traffic Signals: Lime Treatment (Existing Material) (8-inch)**

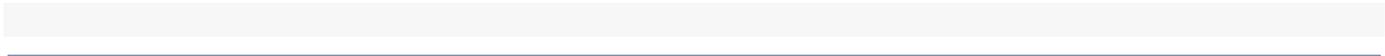
Lot Description **Charles Street - Roadway, Utilities & Traffic Signals**

Quantity **924 square yard**

Unit Price

Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 924

Description



Item **18-65-I--04-14 - Charles Street - Roadway, Utilities & Traffic Signals: Concrete Pavement (Cont Reinf - CRCP) (8-inch)**

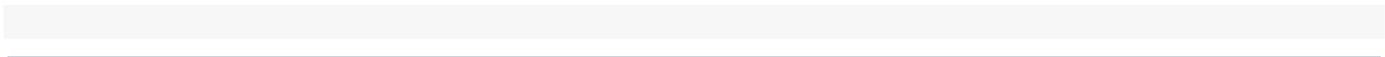
Lot Description **Charles Street - Roadway, Utilities & Traffic Signals**

Quantity **844 square yard**

Unit Price

Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 844

Description



Item **18-65-I--04-15 - Charles Street - Roadway, Utilities & Traffic Signals: Concrete Coloring**

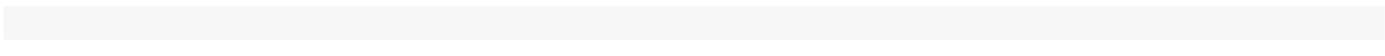
Lot Description **Charles Street - Roadway, Utilities & Traffic Signals**

Quantity **175 square yard**

Unit Price

Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 175

Description



Item **18-65-I--04-16 - Charles Street - Roadway, Utilities & Traffic Signals: 5-inch Thick Concrete Sidewalks**

Lot Description **Charles Street - Roadway, Utilities & Traffic Signals**

Quantity **217 square yard**

Unit Price

Delivery Location **City of Lewisville, Texas**
No Location Specified
 None

Lewisville TX 75057

Qty 217

Description

Item **18-65-I--04-17 - Charles Street - Roadway, Utilities & Traffic Signals: Barrier Free Curb Ramps with Truncated Domes**
 Lot Description **Charles Street - Roadway, Utilities & Traffic Signals**
 Quantity **14 each**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 14

Description

Item **18-65-I--04-18 - Charles Street - Roadway, Utilities & Traffic Signals: Trench Safety**
 Lot Description **Charles Street - Roadway, Utilities & Traffic Signals**
 Quantity **35 linear foot**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 35

Description

Item **18-65-I--04-19 - Charles Street - Roadway, Utilities & Traffic Signals: Install 18-Inch Class III RC Pipe**
 Lot Description **Charles Street - Roadway, Utilities & Traffic Signals**
 Quantity **25 linear foot**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 25

Description

Item **18-65-I--04-20 - Charles Street - Roadway, Utilities & Traffic Signals: Install 21-Inch Class III RC Pipe**
 Lot Description **Charles Street - Roadway, Utilities & Traffic Signals**

Quantity **10 linear foot**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 10

Description

Item **18-65-I--04-21 - Charles Street - Roadway, Utilities & Traffic Signals: Install 5-foot Recessed Curb Inlet**
 Lot Description **Charles Street - Roadway, Utilities & Traffic Signals**
 Quantity **1 each**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 1

Description

Item **18-65-I--04-22 - Charles Street - Roadway, Utilities & Traffic Signals: Install 10-foot Curb Inlet**
 Lot Description **Charles Street - Roadway, Utilities & Traffic Signals**
 Quantity **2 each**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 2

Description

Item **18-65-I--04-23 - Charles Street - Roadway, Utilities & Traffic Signals: Install 4-inch depth Top Soil and Block Sodding**
 Lot Description **Charles Street - Roadway, Utilities & Traffic Signals**
 Quantity **344 square yard**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 344

Description

Item **18-65-I--04-24 - Charles Street - Roadway, Utilities & Traffic Signals: Decomposed Granite Gravel**
 Lot Description **Charles Street - Roadway, Utilities & Traffic Signals**
 Quantity **53 cubic yard**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 53

Description
 With a binder/stabilizer

Item **18-65-I--04-25 - Charles Street - Roadway, Utilities & Traffic Signals: Pavement Markings and Signing**
 Lot Description **Charles Street - Roadway, Utilities & Traffic Signals**
 Quantity **1 lump sum**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 1

Description

Item **18-65-I--04-26 - Charles Street - Roadway, Utilities & Traffic Signals: Traffic Signal Improvements at Charles St and Main St Intersection**
 Lot Description **Charles Street - Roadway, Utilities & Traffic Signals**
 Quantity **1 lump sum**
 Unit Price
 Delivery Location **City of Lewisville, Texas**
No Location Specified
 None
 Lewisville TX 75057
 Qty 1

Description

Item **18-65-I--04-27 - Charles Street - Roadway, Utilities & Traffic Signals: Traffic Signal Improvements at Charles St and Church St Intersection**
 Lot Description **Charles Street - Roadway, Utilities & Traffic Signals**
 Quantity **1 lump sum**
 Unit Price

Delivery Location

City of Lewisville, Texas

No Location Specified

None

Lewisville TX 75057

Qty 1

Description

**Finance Department
Purchasing Division
August 30, 2018**



INVITATION TO BID

BID NAME: Main Street, Mill Street and Charles Street Paving, Drainage, Landscape, and Signalization Improvements

PROJECT NO: G1116

BID NUMBER: 18-65-I

Sealed bids will be received at www.bidsync.com or the Finance Administration - Purchasing Division at 151 West Church Street, Lewisville, Texas 75057 until **2:00 p.m. local time, Thursday, September 20, 2018**. Bids will be publicly opened and read aloud by a Purchasing Division Representative for the construction project listed above at 2:30 pm, September 20, 2018. **If a paper bid is provided, envelopes are to be clearly marked with the bid number, bid opening date and company submitting the bid.**

The City will accept an Excel spreadsheet in lieu of a manual bid sheet. Please note that the spreadsheet needs to contain an authorized signature of the bidder, along with the name of the bidder. In addition, each bidder is to note that unit prices as recorded in the spreadsheet will prevail over any discrepancies with mathematical extension of total prices and the quantities and descriptions listed on the original bid sheets prevail over any discrepancies in regards to quantities or descriptions listed in the spreadsheet.

A pre-bid conference will be held at the Engineering Division at **151 W. Church Street, Lewisville, Texas 75057 in the Community Development Conference Room on the 2nd floor at 3:00 pm on Tuesday, September 11, 2018.** While attendance of the pre-bid conference is not mandatory, it is recommended due to the nature of the project.

The scope of work for the project shall include the following:

Street reconstruction consisting of approximately 15,370 square yards of 8-inch and 11-inch reinforced concrete pavement and concrete driveways, 5,770 square yards of sidewalk, 760 linear feet of 18-inch to 36-inch reinforced concrete storm drain, temporary traffic control, landscaping, irrigation, signalization, street lighting, and related appurtenances on Main Street from Mill Street to Railroad Street, on Mill Street from Purnell Street to College Street and on Charles Street from Main Street to Church Street.

BID BOND REQUIREMENTS

Bidders are required to submit a cashier's or certified check issued by a bank satisfactory to the City of Lewisville, or a Bid Bond (with proper Power of Attorney) from a surety licensed to do business in the State of Texas, payable without recourse to the City of Lewisville, in an amount not less than five (5%) percent of the total amount of the

CITY OF LEWISVILLE, FINANCE ADMINISTRATION - PURCHASING DIVISION
151 West Church Street, Lewisville, TX 75057
(972) 219-3764 Fax (972) 219-3414

base bid submitted to insure that the successful bidder will enter into a contract and execute all necessary bonds within fifteen (15) days after notice of award of the contract to him. **This bid security must be uploaded to BidSync or included in the bid envelope along with the bid sheet for the bidder to be considered responsive.** The successful bidder will be required to furnish the following bonds from a surety licensed to do business in the State of Texas. These bonds, along with proper insurance papers, will be incorporated as part of the final contract documents and will remain in effect until the completion and acceptance of the project. Maintenance bonds shall be in effect based on their stated term after final acceptance of the project:

A bid bond equal to 5% of the project amount is to be included with the sealed bid; a payment bond and performance bond at the project amount and a maintenance bond for two years from the date of the final acceptance.

All bidders are notified that the qualification statement provided in the bid documents must be completed and submitted with the bid proposal. Failure to include this completed form with your bid may cause your bid to be disqualified as non-responsive.

Any questions are to be posted on BidSync. Bidders may post questions up to 2:00 pm Thursday, September 13, 2018. All questions will be responded to by 2:00 pm Monday, September 17, 2018.

The City is not responsible for any costs associated with the preparation of the bid from any vendor. Also, should a vendor bid an alternate; any test costs to prove equality of product will be at the expense of the vendor, not the City of Lewisville.

Each bidder is expected to inspect the site of the work and to inform himself regarding all local conditions. Ignorance of existing conditions of the site will not be a basis for any changes after the award of the bid.

Bids cannot be altered or amended after the submission deadline. Any interlineation, alteration, or erasure made before opening time must be initialed by the signee of the bid, guaranteeing authenticity.

In conformance with applicable statutes utilizing Federal Davis Bacon Wage Rates as adopted by the General Services Commission, the general prevailing wage rates in the locality in which the work is to be performed have been ascertained and such rate shall be the minimum paid for labor employed on this project; unless federal monies are used, in which case, specific wage decisions will be listed as part of the overall bid documents.

The City of Lewisville reserves the right to reject any and all bids, in whole or in part; to waive any informality in any bid. Award will be issued on the basis of lowest responsible bidder.

CITY OF LEWISVILLE

ADVERTISEMENT DATES:



August 31, 2018 and September 7, 2018

Purchasing Manager

PROPOSAL

City of Lewisville
 Purchasing Office
 151 West Church Street
 P.O. Box 299002
 Lewisville, Texas 75029-9002

**MAIN STREET, MILL STREET AND CHARLES STREET PAVING, DRAINAGE,
 LANDSCAPE, AND SIGNALIZATION IMPROVEMENTS
 PROJECT NO. G1116**

Proposal of _____
 (hereinafter called Bidder), a corporation organized and existing under the laws of the State of _____, a partnership, or an individual doing business as _____

(Strike out inapplicable terms).

To the City of Lewisville, Texas (Owner)

The undersigned Bidder, in response to the Notice to Bidders for the construction of the above project and in conformity with the bidding documents; having examined the plans, specifications, related documents and the site of the proposed work; being familiar with all of the conditions relating to the construction of the proposed project, including the availability of materials and labor, hereby proposes to furnish all labor, materials, supplies, equipment, staking, testing, traffic control, superintendence, etc., for the construction of the project in accordance with the plans, specifications, and contract documents at the unit prices proposed herein.

The undersigned Bidder proposes, acknowledges and agrees to construct the entire project as shown on the plans, fully in accordance with the requirements of the plans, specifications, and the contract documents for the prices included in this Proposal and fully understands and agrees that the various items of material, labor and construction not specifically enumerated and provided for herein are considered subsidiary to the several items for which direct payment is specifically provided. Further, the undersigned agrees that one such subsidiary item is the protection, adjustment, maintenance, repair or replacement of all underground lines and services, whether shown on the plans or not, all to the full satisfaction of the City Engineer in a timely manner.

The undersigned Bidder agrees to begin work under the contract on or before the date specified in the written Notice to Proceed, and to fully complete the project within **540 calendar days**. It is specifically stated and understood that the entire construction including clean up shall be completed within the above stated time.

Proposal: Main St, Mill St & Charles St Paving, Drainage, Landscape & Signalization Project No. G1116

A 5% contingency line item will be included with the resulting contract and purchase order for this project. The contingency shall be used at the City's discretion and only upon written approval from the City. The amount listed as a contingency is not an obligation for payment from the City. Any unused contingency is retained by the City and is not payable to the Contractor.

The undersigned Bidder has contacted, within 72 hours prior to the bid opening, the Office of the City Engineer (972) 219-3490, and has determined that all Addenda are as follows:

Addendum No. 1 dated _____ (Signature)

Addendum No. 2 dated _____ (Signature)

Addendum No. 3 dated _____ (Signature)

The undersigned Bidder acknowledges that the Owner reserves the right to waive any informality and to reject any or all proposals.

The undersigned Bidder acknowledges and agrees that this Proposal shall be good and may not be withdrawn for 60 days from the date of bid opening.

The undersigned Bidder has shown unit prices and amounts and agrees that in the case of discrepancy, the unit prices shown in figures shall stand and that the amounts and total will be adjusted to correspond to the unit prices shown.

**SPECIFICATIONS AND CONTRACT DOCUMENTS
FOR THE CONSTRUCTION OF**

**MAIN STREET, MILL STREET AND CHARLES STREET
PAVING, DRAINAGE, LANDSCAPE, AND
SIGNALIZATION IMPROVEMENTS**

PROJECT NO. G1116



LEWISVILLE
Deep Roots. Broad Wings. Bright Future.

**DEPARTMENT OF COMMUNITY DEVELOPMENT
ENGINEERING DIVISION**

AUGUST 2018



STANDARD SPECIFICATIONS

The Standard Specifications for this project are the "Public Works Construction Standards" as published under the authority of the North Central Texas Council of Governments.

A. Special Provisions to the General Provisions of the Standard Specifications:

1. Technical specifications (Special Specifications), if included, in the Contract document package shall supersede the standard specifications.
2. Prospective bidders may make written request to the City Engineer for clarification and alterations in the plans, specifications, and form of contract. Such request must be received by the City Engineer no later than 2:00 p.m. on the Thursday first preceding the Thursday on which the bids are to be opened. The City Engineer will be the sole judge as to the necessity to an addendum or letter of clarification. Oral statements shall in no way be considered as part of the contract and will not be considered as binding.
3. Five (5) sets of the contract documents, exclusive of the "Public Works Construction Standards" referenced above will be furnished without charge to the CONTRACTOR for construction purposes. Additional copies may be obtained from the City at actual reproduction cost.
4. **Item 102.3 Examination of Plans, Specifications and Site of the Work:** Add the following paragraph after Paragraph 2:
The CONTRACTOR may take borings at the site to satisfy his self as to subsurface conditions prior to bidding.
5. **Item 102.4. Preparation of Proposal:** Sentence 4 shall be changed to read: "In the cases of discrepancy between unit prices and amounts, the unit price shown in figures shall stand and the amount and total will be adjusted to correspond to the unit price shown".
6. **Item 103.3.1.1. Performance Bonds:** Paragraph (a) Performance Bond. The last sentence of this paragraph is hereby deleted and replaced with: This Bond shall provide for the repair and/or replacement of all defects due to faulty materials and workmanship that appears within a period of two years from the date of acceptance of the improvements project by the Lewisville City Council.
7. **Item 103.3.3. Sureties: The following applies to Surety Bonds:**

Texas Government Code Title 10, Chapter 2253

“(d) A bond required by this section must be executed by corporate surety in accordance with Chapter 3503, Texas Insurance Code.”

Texas Insurance Code Section 3503.005. Additional Requirements for Certain Bonds

“(a) A bond that is made, given, tendered, or filed under Chapter 53, Property Code, or Chapter 2253, Government Code, may be executed only by a surety company that is

authorized to write surety bonds in this state. If the amount of the bond exceeds \$100,000, the surety company must also:

- (1) hold a certificate of authority from the United States secretary of the treasury to qualify as a surety on obligations permitted or required under federal law; or
- (2) have obtained reinsurance for any liability in excess of \$100,000 from a reinsurer that:
 - (A) is an authorized reinsurer in this state; and
 - (B) holds a certificate of authority from the United States secretary of the treasury to qualify as a surety or reinsurer on obligations permitted or required under federal law.

“(b) To determine whether the surety on the bond or the reinsurer holds a certificate of authority from the United States secretary of the treasury, a party may conclusively rely on the list published in the Federal Register by the United States Department of the Treasury, covering the date on which the bond was executed, of the companies holding certificates of authority as acceptable sureties on federal bonds and as acceptable reinsuring companies. A purchaser, insurer of title, or lender acquiring or insuring an interest in or title to real property may also conclusively rely on, and is protected by, a statement on a recorded bond or a sworn, recorded statement by the surety that refers to the specific recorded bond and states that, at the time the bond was executed, the surety complied with Subsection (a)(1) or (2).”

8. **Item 103.4. Insurance:** delete and replace with the following:

Vendor shall procure and maintain for the duration of the contract, insurance against claims for injuries to persons or damages to property, which may arise from or in connection with the performance of the work hereunder by the vendor, his agents, representatives, employees or subcontractors. The cost of such insurance shall be included in the Vendor’s bid.

A. MINIMUM SCOPE OF INSURANCE

Coverage shall be at least as broad as:

1. Insurance Services Office Commercial General Liability coverage “occurrence” form CG 00 01 (10 01). **“Claims Made” form is unacceptable.**
2. Workers’ Compensation insurance as required by the Labor Code of the State of Texas, including Employers’ Liability Insurance.
3. Automobile Liability – as required by the State of Texas, covering all owned, hired, or non-owned vehicles. Automobile Liability is only required if vehicle(s) will be used under this contract. Coverage not required for delivery services.

B. MINIMUM LIMITS OF INSURANCE

Vendor shall maintain throughout contract limits not less than:

1. Commercial General Liability: \$500,000 per occurrence/\$1,000,000 aggregate for bodily injury, personal injury and property damage. Policy will include coverage for:
 - a. Premises – Operations
 - b. Broad Form Contractual Liability
 - c. Products and Completed Operations
 - d. Use of Contractors and Subcontractors
 - e. Personal Injury
 - f. Broad Form Property Damage
 - g. If applicable, Explosion Collapse and Underground (XCU) Coverage, Fire Damage, and Medical Expenses.

NOTE: The aggregate loss limit applies to each project.

2. Workers' Compensation and Employer's Liability: Workers' Compensation Statutory limits as required by the Labor Code of the State of Texas and Employer's Liability minimum limits of \$500,000 per injury, \$500,000 per occurrence, and \$500,000 per occupational disease.
3. Automobile Liability - \$500,000 Combined Single Limit. Limits can only be reduced if approved by the HR Director or designee.
4. Builders' Risk Insurance (as applicable) – Completed value form, insurance carried must equal the completed value of the structure.

C. DEDUCTIBLES AND SELF-INSURED RETENTIONS

Any deductible or self-insured retentions must be declared to and approved by the City.

D. OTHER INSURANCE PROVISIONS

The policies are to contain, or be endorsed to contain the following provisions:

1. General Liability and Automobile Liability Coverages

- a. The City, its officers, officials, employees, boards/commissions and volunteers are to be added as “Additional Insured” as respects liability arising out of activities performed by or on behalf of the vendor, products and completed operations of the vendor, premises owned, occupied or used by the Contractor. The coverage shall contain no special limitations on the scope of protection afforded to the City, its officers, officials, employees or volunteers. It is understood that the business auto policy under “Who is an Insured” automatically provides liability coverage in favor of the City. The coverage shall include defense of claims against the City as additional insured.
 - b. The vendor’s insurance coverage shall be primary and non-contributory insurance as respects the City, its officers, officials, employees and volunteers. Any insurance or self-insurance maintained by the City, its officers, officials, employees or volunteers shall be excess of the vendor’s insurance and shall not contribute with it.
 - c. Any failure to comply with reporting provisions of the policy shall not affect coverage provided to the City, its officers, officials, and employees, Boards and Commissions or volunteers.
 - d. The vendor’s insurance shall apply separately to each insured against whose claim is made or suit is brought, except to the limits of the insured’s liability.
2. **Waiver of Subrogation – All coverages**
Each insurance policy required by this exhibit shall waive all rights of subrogation against the City, its officers, officials, employees, and volunteers for losses arising from work performed by the vendor for the City.
 3. **Notice of Cancellation - All Coverages**
Each insurance policy required by this exhibit shall be endorsed to state that coverage shall not be suspended, voided, canceled or non-renewed by either party, reduced in coverage or in limits except after thirty (30) days prior written notice by certified mail, return receipt requested, has been given the City, or ten (10) days prior written notice for non-payment of premium.

E. ACCEPTABILITY OF INSURERS

The City prefers that Insurance be placed with insurers with an A.M. Best’s rating of no less than **A-:VI, or, A or better** by Standard and Poors.

F. VERIFICATION OF COVERAGE

Contractor shall furnish the City with certificates of insurance affecting coverage required. The certificates for each insurance policy are to be signed by a person

authorized by that insurer to bind coverage on its behalf. Certificates of Insurance must be provided on forms approved by the Texas Department of Insurance. City will not accept Memorandums of Insurance or Binders as proof of insurance. The City reserves the right to require complete, certified copies of all required insurance policies at any time.

G. HOLD HARMLESS AND INDEMNIFICATION

THE CONSULTANT/CONTRACTOR AGREES TO DEFEND, INDEMNIFY AND HOLD THE CITY, ITS OFFICERS, AGENTS AND EMPLOYEES, HARMLESS AGAINST ANY AND ALL CLAIMS, LAWSUITS, JUDGMENTS, COSTS AND EXPENSES FOR PERSONAL INJURY (INCLUDING DEATH), PROPERTY DAMAGE OR OTHER HARM FOR WHICH RECOVERY OF DAMAGES IS SOUGHT, SUFFERED BY ANY PERSON OR PERSONS, THAT MAY ARISE OUT OF OR BE OCCASIONED BY CONSULTANT'S/CONTRACTOR'S BREACH OF ANY OF THESE TERMS AND CONDITIONS OR BY ANY NEGLIGENT OR STRICTLY LIABLE ACT OR OMISSION OR INTENTIONAL TORT, INTELLECTUAL PROPERTY INFRINGEMENT, OR FAILURE TO PAY A SUBCONTRACTOR OR SUPPLIER COMMITTED BY, CONSULTANT/CONTRACTOR, ITS OFFICERS, AGENTS, EMPLOYEES OR SUBCONTRACTORS, IN THE PERFORMANCE OF THIS AGREEMENT; EXCEPT THAT THE INDEMNITY PROVIDED FOR IN THE PARAGRAPH SHALL NOT APPLY TO ANY LIABILITY RESULTING FROM THE SOLE NEGLIGENCE OR FAULT OF THE CITY, ITS OFFICERS, AGENTS, EMPLOYEES OR SEPARATE CONTRACTORS, AND IN THE EVENT OF JOINT AND CONCURRING NEGLIGENCE OR FAULT OF THE CONSULTANT/CONTRACTOR AND THE CITY, RESPONSIBILITY AND INDEMNITY, IF ANY, SHALL BE APPORTIONED IN ACCORDANCE WITH THE LAW OF THE STATE OF TEXAS, WITHOUT WAIVING ANY GOVERNMENTAL IMMUNITY AVAILABLE TO THE CITY UNDER TEXAS LAW AND WITHOUT WAIVING ANY DEFENSES OF THE PARTIES UNDER TEXAS LAW AND THE CITY'S REASONABLE ATTORNEY'S FEES SHALL BE REIMBURSED IN PROPORTION TO THE CONSULTANT'S LIABILITY. THE PROVISIONS OF THIS PARAGRAPH ARE SOLELY FOR THE BENEFIT OF THE PARTIES HERETO AND NOT INTENDED TO CREATE OR GRANT ANY RIGHTS, CONTRACTUAL OR OTHERWISE, TO ANY OTHER PERSON OR ENTITY.

H. PROOF OF INSURANCE

Contractor is required to submit proof of insurance on a form acceptable to the City of Lewisville. Certificates of Insurance similar to the ACCORD form are acceptable. City will not accept Memorandums of Insurance or Binders as proof of insurance. City, at its own discretion, may require a copy of any policy presented to the City.

I. STATE REQUIREMENTS FOR WORKERS COMPENSATION INSURANCE

As required by: 28 Tex.Admin.code §110.110(c)(7):

A. Definitions:

Certificate of coverage ("certificate")- A copy of a certificate of insurance, a certificate of authority to self-insure issued by the commission, or a coverage agreement (DWC-81, DWC-82, DWC-83, or DWC-84), showing statutory workers' compensation insurance coverage for the person's or entity's employees providing services on a project, for the duration of the project.

Duration of the project - includes the time from the beginning of the work on the project until the contractor's/person's work on the project has been completed and accepted by the governmental entity.

Persons providing services on the project ("subcontractor" in §406.096) - includes all persons or entities performing all or part of the services the contractor has undertaken to perform on the project, regardless of whether that person contracted directly with the contractor and regardless of whether that person has employees. This includes, without limitation, independent contractors, subcontractors, leasing companies, motor carriers, owner-operators, employees of any such entity, or employees of any entity which furnishes persons to provide services on the project. "Services" include, without limitation, providing, hauling, or delivering equipment or materials, or providing labor, transportation, or other service related to a project. "Services" does not include activities unrelated to the project, such as food/beverage vendors, office supply deliveries, and delivery of portable toilets.

B. The contractor shall provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all employees of the contractor providing services on the project, for the duration of the project.

C. The Contractor must provide a certificate of coverage to the governmental entity prior to being awarded the contract.

D. If the coverage period shown on the contractor's current certificate of coverage ends during the duration of the project, the contractor must, prior to the end of the coverage period, file a new certificate of coverage with the governmental entity showing that coverage has been extended.

E. The contractor shall obtain from each person providing services on a project, and provide to the governmental entity:

(1) a certificate of coverage, prior to that person beginning work on the project, so the governmental entity will have on file certificates of coverage showing coverage for all persons providing services on the project; and

(2) no later than seven days after receipt by the contractor, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project.

F. The contractor shall retain all required certificates of coverage for the duration of the project and for one year thereafter.

G. The contractor shall notify the governmental entity in writing by certified mail or personal delivery, within 10 days after the contractor knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project.

H. The contractor shall post on each project site a notice, in the text, form and manner prescribed by the Texas Department of Insurance, Division of Workers' Compensation, informing all persons providing services on the project that they are required to be covered, and stating how a person may verify coverage and report lack of coverage.

I. The contractor shall contractually require each person with whom it contracts to provide services on a project, to:

(1) provide coverage, based on proper reporting of classification codes and payroll amounts and filing of any coverage agreements, which meets the statutory requirements of Texas Labor Code, Section 401.011(44) for all of its employees providing services on the project, for the duration of the project;

(2) provide to the contractor, prior to that person beginning work on the project, a certificate of coverage showing that coverage is being provided for all employees of the person providing services on the project, for the duration of the project;

(3) provide the contractor, prior to the end of the coverage period, a new certificate of coverage showing extension of coverage, if the coverage period shown on the current certificate of coverage ends during the duration of the project;

(4) obtain from each other person with whom it contracts, and provide to the contractor:

(a) a certificate of coverage, prior to the other person beginning work on the project; and

(b) a new certificate of coverage showing extension of coverage, prior to the end of the coverage period, if the coverage period shown on the current certificate of coverage ends during the duration of the project;

(5) retain all required certificates of coverage on file for the duration of the project and for one year thereafter;

(6) notify the governmental entity in writing by certified mail or personal delivery, within 10 days after the person knew or should have known, of any change that materially affects the provision of coverage of any person providing services on the project; and

(7) contractually require each person with whom it contracts, to perform as required by paragraphs (1) - (7), with the certificates of coverage to be provided to the person for whom they are providing services.

J. By signing this contract or providing or causing to be provided a certificate of coverage, the contractor is representing to the governmental entity that all employees of the contractor who will provide services on the project will be covered by workers' compensation coverage for the duration of the project, that the coverage will be based on proper reporting of classification codes and payroll amounts, and that all coverage agreements will be filed with the appropriate insurance carrier or, in the case of a self-insured, with the commission's Division of Self-Insurance Regulation. Providing false or misleading information may subject the contractor to administrative penalties, criminal penalties, civil penalties, or other civil actions.

K. The contractor's failure to comply with any of these provisions is a breach of contract by the contractor which entitles the governmental entity to declare the contract void if the contractor does not remedy the breach within ten days after receipt of notice of breach from the governmental entity.

9. **Item 105.1.1. Priority of Contract Documents** is revised as follows: Insert the words "addenda (last over first)" between "Proposal" and "Special Provision".
10. **Item 105.1.3. Contract Drawings and Specifications:** Obtaining copies of NCTCOG Public Works Construction Standards is the responsibility of the CONTRACTOR.
11. **Item 105.2.2. Special Warranty:** The first sentence of this paragraph is hereby deleted and replaced with:
 "If within two years after the final acceptance of the work by the OWNER, as evidenced by the final certificate of acceptance or within a longer or shorter period of time as may be prescribed by law or by the terms of any other special warranty on designated equipment, any of the work is found to be defective or not in accordance with the contract documents, the CONTRACTOR shall correct it promptly after receipt of a written notice from the OWNER to do so".

12. **Special Provision to Item 105.3. Shop Drawings, Product Data and Samples:** add the following:
"Review of Shop Drawings by the CITY and/or ENGINEER shall be for the sole purpose of determining the sufficiency of said drawings or schedules to result in finished improvements in conformance with the plans and specifications, and shall not relieve the CONTRACTOR of his duty as an independent contractor. It being understood and agreed that the Engineer does not assume any duty to pass upon the propriety or adequacy of such drawings or schedules or any means or methods reflected thereby in relation to the safety of either person or property during the contractor's performance hereunder."
13. **Item 105.4: "Construction Stakes" is amended to the extent that the CONTRACTOR** will provide construction staking for the project. The ENGINEER will verify and re-establish monuments set for horizontal and vertical control. A minimum of five (5) working days notice will be given by the CONTRACTOR. The CONTRACTOR shall provide all construction staking and other materials and incidentals necessary for the correct construction of all facilities. It is the CONTRACTOR'S sole responsibility to ensure the correctness of any stakes and that the work is constructed to the lines and grades shown on the plans."
14. **Item 105.6 Supervision by Contractor:** The CONTRACTOR shall designate a **full-time superintendent who shall be on the job site at all times during construction including times when work is being performed by subcontractors.** The OWNER'S Representative will communicate only with the superintendent. The CONTRACTOR may replace the designated superintendent by written notification to the OWNER.
15. **Special Provision to Item 105.7.1. Authority of the Engineer:** add the following:
"The Engineer shall make periodic visits to the site to familiarize himself generally with the progress of the executed work and to determine if such work generally meets the essential performance and design features and the technical and functional engineering requirements of the Contract Documents; provided and except, however, that the Engineer shall not be responsible for making any detailed, exhaustive, comprehensive or continuous on-site inspection of the quality or quantity of the work or be in any way responsible, directly or indirectly, for the construction means, methods, techniques, sequences, quality, procedures, programs, safety precautions or lack of same incident thereto or in connection therewith. Notwithstanding any other provision of this agreement or any other Contract Document, the Engineer shall not be in any way responsible or liable for any acts, errors, omissions or negligence of the CONTRACTOR, any subcontractor or any of the CONTRACTOR'S or sub-contractor's agents, or employees or any other person, firm or corporation performing or attempting to perform any of the work."
16. **Item 106.5: Samples and Tests of Materials:** Delete the first and last paragraphs on Item 106.5 and replace with the following:
"The CONTRACTOR shall engage the services of an acceptable testing laboratory company to perform all required testing services. The CONTRACTOR (not the OWNER)

shall pay all costs for these services, including any retesting after failure to pass tests. The CONTRACTOR shall obtain OWNER'S acceptance of the testing laboratory before having the services performed."

Written reports of tests and engineering data furnished by CONTRACTOR for OWNER'S review shall be submitted as specified in Item 105.3, "Shop Drawings, Product Data and Samples" and as modified by the Special Specifications.

17. **Special Provisions to Item 107.2. Indemnification:** delete Item 107.2. in its entirety and substitute the following:

"The CONTRACTOR and his sureties shall indemnify, defend and save harmless the OWNER and all of their officers, agents and employees, Engineer and all of its officers and employees from all suits, actions or claims of any character, name and description brought for or on account of any injuries, including death or damages received or sustained by any person, persons or property on account of the operations of the CONTRACTOR, his agents, employees or subcontractors; or on account of any negligent act or fault of the CONTRACTOR, his agents, employees or subcontractors in the execution of said contract; or on account of the failure of the CONTRACTOR to provide the necessary barricades, warning lights or signs; and shall be required to pay any judgment, with cost, which may be obtained against the OWNER or Engineer growing out of such injury, including death or damage."

18. **Item 107.11. Supervision and Construction Procedures:** The CONTRACTOR'S attention is drawn to paragraphs 1 and 4 of this item and paragraphs 1 and 3 of Item 105.6.

19. **Item 107.24. Project Clean-Up:** All objectionable surplus and waste material due to construction shall be removed from the site at the CONTRACTOR'S expense.

20. **Item 108.1. Progress Schedule:** add the following paragraph:

"The CONTRACTOR shall submit to the OWNER a construction schedule setting out items of construction, road closings, detours, utility interruptions, limits, times and actual dates. If the schedule is acceptable to the OWNER, the OWNER will approve it; if the schedule is unacceptable, it will be returned to the CONTRACTOR for revision and resubmittal. If the CONTRACTOR wants to deviate from the approved schedule, he must submit a revised schedule to the OWNER for consideration. The entire work shall be prosecuted in a continuous manner in accordance with the approved schedule. Proposed stockpile locations must be approved by the OWNER prior to depositing material. The CONTRACTOR shall update this schedule on a monthly basis."

21. **Item 108.5. Subcontracts:** add the following paragraph:

"The CONTRACTOR shall perform with his own organization and with the assistance of workmen under his immediate superintendence, work of a value not less than 50 percent of the value of all work embraced in the contract exclusive of items not commonly found in contract for similar work and exclusive of items that require highly specialized knowledge, craftsman and/or equipment not ordinarily available in the organization of CONTRACTORS performing work of the character embraced in the contract". For the purpose of evaluating the percentage of work performed by subcontractors, the cost of all equipment, supplies, and

materials used or installed on the project by subcontractors shall be considered as part of the work of subcontractors. This will apply even if the contractor supplies and pays for some or all equipment, supplies, or materials used by subcontractors.

22. **Item 108.8. Delays; Extension of Time; Liquidated Damages:** Delete the first paragraph of Section 108.8. and replace with the following:

“The CONTRACTOR hereby agrees that no work will be performed on CITY holidays or on Sundays. In addition, he agrees that work will be performed between 7:00 a.m. and sunset on weekdays and between 8:00 a.m. and 6:00 p.m. on Saturdays. The only exception to the preceding will be the performance of work in response to emergency situations and/or when directed to work by the OWNER. ‘Off-Peak’ times are defined as the hours other than the rush-hour time periods between 7:00 am and 9:00 am and between 4:00 pm and 6:00 pm Monday through Friday. Also, the CONTRACTOR hereby concurs that the preceding has been taken into account in setting the contract time.” The CONTRACTOR will be responsible for reimbursing the City of Lewisville for overtime charges for construction inspection services on Saturdays, Sundays and all City holidays. The overtime charges will be based on the top of range overtime rate for an Engineering Construction Inspector plus eighteen percent (18%) per hour and a minimum of four (4) hours will be charged for each occurrence of such service. The overtime charges will be billed on a monthly basis. Failure to pay for these services will result in delaying the final acceptance and payment.

“The CONTRACTOR shall be entitled to an extension of working time under this contract only when claim for such extension is submitted to the OWNER in writing by the CONTRACTOR within seven days from and after the time when any alleged cause of delay shall occur; and then only when such time is approved by the OWNER. In adjusting the working time for the completion of the project, the OWNER will consider delays due to acts of God, or the public enemy, acts of the OWNER, fires, floods, epidemics and quarantine restrictions. The OWNER may, but is not obligated to, take into account any unforeseeable causes of delay which the OWNER considers beyond the control and without the fault or negligence of the CONTRACTOR. It is anticipated that during the course of the contract, inclement weather (rain or freezing temperatures) will hinder or prevent work. The contract time has been established assuming that up to 20% of the contract days will be inclement weather days, during which no work can be performed. No extension of time will be granted for such inclement weather days. The OWNER may grant an extension of time for inclement weather days beyond 20% of the contract time, but is under no obligation to do so.”

23. **Item 109.3. Payment for Extra Work:** Replace the first sentence of 109.3.1. General; with the following:

“No work shall be undertaken which requires extra payment without having executed a change order or field change approved by the CONTRACTOR and the OWNER, except when specifically ordered to do so in writing.”

24. **Item 109.5. Monthly Estimate, Partial Payments, Retainage, Final Inspection, Acceptance and Final Payment**

Delete from the first paragraph of 109.5.1: "The monthly estimate may include acceptable non-perishable materials delivered to the work; such payment shall be allowed on same percentage basis of the net invoice value as provided hereinafter."

Add in its place, the following:

The OWNER will pay for materials on hand only under the following conditions:

- a. The CONTRACTOR shall provide proof of payment for the materials.
 - b. The materials shall be secured in a manner acceptable to the OWNER.
 - c. Payment will not be made for small items, and other items not easily measured.
 - d. No payment will be made for small quantities of material on hand (less than 0.5 percent of the contract amount).
 - e. No payment for materials on hand will be made for items such as paint, mastics, cement, and other similar materials.
25. Delays associated with delivery of materials of appurtenances by the manufactures will not be considered for any extension of contract time. It shall be the sole responsibility of the CONTRACTOR to insure that the materials are manufactured and delivered on time.

B. Special Provisions to the Materials and Construction Methods of the Standard Specifications:

Only items in the Proposal are Pay Items. Other specification items will be complied with; however, their measurement and payment provisions are hereby deleted.

The price bid shall cover all work required by the Contract Documents. All costs in connection with the proper and successful completion of the work, including furnishing all materials, equipment, supplies, and appurtenances; providing all construction plant, equipment, and tools; and performing all necessary labor and supervision to fully complete the work, shall be included in the unit and lump sum prices bid. All work not specifically set forth as a pay item in the Proposal shall be considered a subsidiary obligation of the CONTRACTOR and all costs in connection therewith shall be included in the prices bid.

Work that is subsidiary to pay items includes, but is not limited to the following: protection, adjustment, maintenance, repair or replacement of all underground public or franchise utilities and services, whether shown on the plans or not; cutting and removing and plugging existing utilities, as required; crushed stone base, embedment sand; modified flowable backfill; pipe fittings; bends; joint restraint and thrust blocks; valve stack risers, concrete valve boxes; valve extensions; grouting abandoned waterlines; cutting and plugging waterlines as required; removal or abandonment of existing valves; removal of existing fire hydrant assembly; delivery of salvaged items to 1100 North Kealy Avenue; maintaining water and sanitary sewer service to all adjacent properties; adjustment of the existing water line to avoid conflicts; trench dewatering; preventive measures of pipe flotation; installation of temporary orange polyethylene construction fencing adjacent to residences and businesses in construction areas as required; removal of existing thrust blocks; repair and replacement of landscape irrigation systems damaged during construction by a licensed irrigator; topsoil and sodding in areas outside of pay limits; placement of sod in all remaining disturbed areas after contract time has expired; concrete and/or asphalt pavement replacement (in areas outside of pay limits damaged by contractor); protection against flooding; removal of waste material from the site; replacement of property markers or monuments disturbed; sawcut and removal of existing pavement; replacement of damaged fences; clean up; additional traffic control not in plans including message boards; temporary asphalt pavement; replacement of existing traffic buttons and striping; miscellaneous grading; all other work required to complete the project and restore the areas of construction to their preconstruction condition; disposal of heavily chlorinated water main flushing water and all required testing of all the of the components of the project.

C. Special provisions to the materials and construction methods of the Standard Specifications as applicable to the Proposal Pay Items are as follows:

1. Payment for "Start-Up" shall be on a lump sum basis. The amount bid for these items shall not exceed five (5) percent of the Total Amount Bid. If the bid for these items exceeds 5% of the total amount bid, the amount in excess of 5% shall be paid on the project progress estimates throughout the duration of the project, with the amount determined by the percent complete on all other bid items for the project.
2. Payment for "Traffic Control" shall be on a lump sum basis. This item shall include message boards, detours, barrels, removing striping, temporary lane lines and/or markers, construction signing and barricades, construction pavement markers, temporary asphalt

and all other work required to provide for passage of vehicular traffic for all phases of construction. Access must be maintained at all times to all houses and businesses. During construction, handicap access shall be provided to residents in need as requested. The amount bid for this item shall be paid over the duration of the project with the amount paid on each monthly progress estimate determined by the percent complete on all other bid items.

3. Payment for "Erosion Control" shall be on a lump sum basis. This item shall include installation and maintenance of silt fence, construction entrances, inlet protection, rock check dams, other erosion control features, and all costs for preparing, implementing and maintaining a Storm Water Pollution Prevention Plan (SWPPP), from the beginning of construction through final acceptance and establishment of grass coverage, including all fees and costs associated with submitting an NOI and NOT for both the CONTRACTOR and the CITY. The amount bid for this item shall be paid over the duration of the project with the amount paid on each monthly progress estimate determined by the percent complete on all other bid items. It will be the responsibility of the CONTRACTOR to develop a SWPPP. The CONTRACTOR shall submit two (2) copies of the plan to the OWNER for general conformance review. Once the SWPPP is deemed acceptable, the CONTRACTOR shall obtain a National Pollutant Discharge Elimination System (NPDES) permit. The SWPPP is to be kept on the construction site and implemented throughout the construction duration. Once construction is complete, the system shall be dismantled and removed from the site.
4. Payment for "Prepare Right-of-Way" shall be per 100-foot station as measured along the centerline of street rights-of-way from beginning of street paving to end of street paving. This pay item will also include removal of improvements or obstructions not specifically provided for in other pay items of the Bid Proposal such as temporary relocation and reinstallation of mailboxes, as required. Additional items included in this pay item, but not limited to, will be removing landscaping, shrubbery, and plantings and trimming trees as needed that are located within the right-of-way. Any damage to yard areas shall be restored at no additional pay, including planters and landscape edging and irrigation systems.
5. All bid proposal items for "Remove and Dispose of Existing Asphalt Pavement", "Remove and Dispose of Existing Concrete Pavement", "Remove and Dispose of Concrete Median" and "Remove and Dispose of Concrete Sidewalk" will not be measured for payment. Payment will be made using the plan quantities given in the Bid Schedule for these items. This item shall include sawcutting, removing, and disposing off-site the existing asphalt pavement, existing concrete pavement, concrete median, sidewalks, driveways, curb and gutter, etc. The CONTRACTOR shall provide a saw cut joint at the limits of pavement removal.
6. Payment for "Removal and Dispose of Retaining Wall structure" and "Removal and Dispose of Block Wall", "Removal and Dispose of Existing Brick Wall" shall be per linear foot.
7. Payment for "Remove and Relocate Mailboxes" shall include the temporary relocation during construction and resetting mailboxes in the permanent location upon completion of construction. Multiple mailboxes mounted on a single post is considered a single mailbox for pay purposes. For pay purposes, post-type mailboxes include those made of all

materials; i.e. metal, wood, and plastic. Payment shall be made when the mailbox is reset to the permanent location.

8. Payment for “Remove and Salvage Electric Riser and Meter Base” shall include the removal and salvage of the Electric Riser and Meter Base. The salvaged materials shall be taken to the Public Works yard at 1100 N. Kealy Ave (attention: Joe Galicia, 972-219-3516).
9. Payment for “Excavation (Roadway)” will not be measured for payment. Payment will be made using the plan quantities given in the Bid Proposal. All street excavation, channel excavation, grading, embankment, and wasting of surplus and unsuitable material are subsidiary to this bid item.
10. Payment for Lime Stabilized Subgrade will be based on final quantities derived from the pay limits determined by sulfate and lime series testing after street excavation and embankment construction. Subgrade preparation shall include scarifying and recompaction of the subgrade. The subgrade shall be scarified to a depth of eight inches and recompacted to 95 percent Standard Proctor Density. The proposed subgrade for Main Street and Charles Street is 8 inches thick with lime treatment at a rate of 8% (48 lbs) per square yard. The price bid shall include fine grading in preparation for paving and disposal offsite of any surplus materials.
11. Payment for “8-Inch Reinforced Concrete Pavement (Jointed – Concrete Pavement Contraction Design - CPCD)”, “11-Inch Concrete Pavement (Continuously Reinforced Concrete Pavement – CRCP)” and “Reinforced Concrete Driveways” shall be made on the basis of price per square yard (SY) and shall include all costs associated with staged construction sequencing including mobilization and remobilization costs, additional labor required for hand finishing intersections and pavement leave-outs, constructing temporary ramps to permit access to driveways, and any additional work required to maintain access to properties during construction. This bid item shall include 6-inch curb and gutter. Any HMAC (Type C) transitions from new concrete pavement to existing asphalt pavement shall be subsidiary to the concrete pavement pay items.
12. Payment for “8-Inch Concrete Pavement High Early Strength (Jointed - CPCD)” and “11-Inch Concrete Pavement High Early Strength (Continuous Reinforcement – CRCP)” shall be made on the basis of price per square yard (SY) and shall include all costs associated with staged construction sequencing including mobilization and remobilization costs, additional labor required for hand finishing intersections and pavement leave-outs, constructing temporary ramps to permit access to driveways, and any additional work required to maintain access to properties during construction. This bid item shall include 6-inch curb and gutter where indicated on the plans. Any HMAC (Type C) transitions from new concrete pavement to existing asphalt pavement shall be subsidiary to the concrete pavement pay items.
13. Payment for “Concrete Coloring” shall be made on the basis of price by square yard. Bid item for Concrete Coloring at crosswalks, as indicated on the plans, is considered integral to the entire concrete thickness. This item is only for the coloring and does not include the cost of the concrete. The color for the integral concrete coloring shall be ‘Quarry Red (Scofield manufacturer)’ or approved equal.

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14. Payment for the “4-inch Concrete Sidewalk” shall be made on the basis of price per square yard. The 4-inch Concrete Sidewalk bid item only includes the sidewalk on Mill Street north of Walters St.
15. Payment for “Install Retaining Wall (City Standard)” shall be made on the basis of price per linear foot (LF) and shall include the cost of furnishing and installing weepholes, filter material, geotextile, sand cushion, and reinforcing steel. This bid item quantity only includes the retaining wall with integral sidewalk on Mill Street north of Walters St and on Leonard Street south of Main Street.
16. Payment for “Cellular Lightweight Concrete Retaining Wall” shall be made on the basis of price per cubic yard (CY). Bid item for “Cellular Lightweight Concrete Retaining Wall” includes the retaining wall along the driveway on Leonard Street south of Main Street.
17. Payment for “Hot Mix Asphalt (HMA)” shall include costs for furnishing materials, temporary stockpiling, assistance provided in stockpile sampling and operations to level stockpiles for measurement, loading, hauling, delivery of materials, spreading, blading, mixing, shaping, placing, compacting, reworking, finishing, correcting locations where thickness is deficient, curing, and equipment, labor, tools and incidentals. Any additional imported materials listed above shall be incidental to the project and not paid for separately.
18. Payment for “Trench Safety” shall be per linear foot of trench. The CONTRACTOR is responsible for the preparation and proper execution of the Trench Safety Program. Trench safety and excavation systems must meet all the requirements of the Occupational Safety and Health Administration’s Standards for trench safety in effect during the construction period for the project.
19. Bid items for the installation of reinforced concrete storm drain pipes will be measured along the pipe centerline once in place. There shall be no separate payment for pipe through structures such as manholes, junction boxes, etc. All fittings shall be subsidiary to storm drain bid items.
20. Bid Items for the ‘Removal and Dispose of Existing storm drain inlets’, ‘Removal and Dispose of existing slotted storm drain inlet’ and ‘Removal and Dispose of Storm Drain pipes shall include the cost of disposing of all removed materials off-site. Payment for the storm drain inlet shall be per each item removed and payment for the slotted storm drain inlet and storm drain pipes shall be per linear foot.
21. Payment for “Pavement Markings and Signage” shall be paid for on a lump sum basis. This item includes all costs for the installation of all permanent pavement markings including the raised reflective pavement markers, pavement surface preparation for markings, all permanent and regulatory signs, and the relocation of existing signs including pole mounted street name signs. The sign posts and fittings shall be powder coated with black color paint. The top of the sign posts shall be fitted with a metal ball cap painted with black color. All conflicting striping and/or signage shall be removed and is considered subsidiary to this bid item.
22. Payment for “Wheel Stops” shall be paid per each item. Each wheel stop shall be pre-cast concrete, 6-foot long and be anchored with two 5/8” diameter steel rods 12 inches long.

23. Payment for “Rectangular Rapid Flashing Beacons (Solar Powered RRFB)” shall be made per each item installed.
24. Payment for “Remove and Salvage Fire Hydrant Assembly” shall include but is not limited to: excavating, removal, disposal and appurtenances. This item shall include delivery of salvaged materials to 1100 N. Kealy Ave.
25. Payment for “Install Fire Hydrant w/ 6” Valve & Box Assembly” shall include fire hydrant, valve, connection, painting of the fire hydrant, Fire Department Connection (FDC), excavation, backfilling, compacting and grading, complete in place.
26. Payment for “Over-the-Street Banner Poles” shall be on a lump sum basis for the installation of the poles, galvanized steel cables and attachments.
 - a. The foundations installed for the over-the-street banner poles shall be according to TxDOT foundation type 36-A per TxDOT standard drawing TS-FD-12.
 - b. The banner poles shall be 30 feet tall. The banner poles are round poles similar to traffic signal poles per TxDOT standard specifications and shall be powder coated with black color paint. The top of the banner poles shall be fitted with a spherical pole cap powder coated with black color paint. For the poles, reference TxDOT standard drawing SP-80(1)-12 for ‘Traffic Signal Support Structures Strain Pole Assemblies (80 mph wind zone)’.
 - c. Two 3/8-inch thick galvanized steel cables shall be mounted on the banner poles for the purpose of holding the banner over the street. The galvanized steel cables shall be vertically separated 4 feet apart.
 - d. The bottom steel cable is mounted 24 feet above the ground surface.
27. Payment for “Traffic Signals” shall be paid for on a lump sum basis per each intersection. Traffic signal installation shall comply with the plans and TxDOT specifications. All items and appurtenances including but not limited to the foundation, signal pole, pedestrian signal poles, mast arm, signal heads, APS pedestrian pushbuttons, opticom detectors, VIVDS cameras, signs, mounting and associated cables shall be considered subsidiary to this bid item and shall be installed in accordance with the plans. The signal poles, pedestrian signal poles and the pedestrian pushbutton poles shall be powder coated with black color paint. All removed items shall be delivered to the City of Lewisville Public Services storage yard at 1100 North Kealy Ave. in the City of Lewisville. The unit price shall include all labor, materials, tools, equipment and incidentals necessary to complete the work in accordance with the plans, specifications and details.

For the traffic signal at the intersection of Main Street and Mill Street, install a new pedestal for the electric service meter [Electrol Systems, Model TYD (120/240)100(NS)AL(E)PS(U)] near the power pole supplying power for the traffic signal and lighting at the intersection. The power pole is located approximately 160 feet south from the controller cabinet location on the east side of Mill Street. A 2-inch conduit with wiring shall be installed from the new pedestal to the ground box near the controller cabinet and then to the controller cabinet at the southeast corner of the intersection. The 2-inch conduit shall be laid outside the proposed sidewalk as practical. Texas New Mexico Power (TNMP) will provide electric service to the pedestal.

28. Payment for Concrete Paving Type 1 (Brush Broom Finish), Concrete Paving Type 1 (Sand Blasted Finish) and Landscape Curb shall be paid per square yard (SY) and shall include but is not limited to excavating, backfilling, compacting and grading, subgrade, concrete and reinforcing, curing, concrete additives as required, import of backfill as necessary, joints and sealants, special finishes, stone, mortar and grout, boardwalk materials and hardware. Installation of the Curb Opening with Spigot shown on sheet 80A in the plans, located between 420 S Mill St and 316 S Mill St properties will be incidental to the cost of installation of Concrete Paving Type 1 (Brush Broom Finish).
29. Payment for “Decomposed Granite Gravel (with a Binder/Stabilizer)” shall be paid on the basis of price per cubic yard (CY). The decomposed granite gravel shall be blended with a stabilizer or binding stabilizer to reduce tracking of loose materials and improve surface stability, withstand the traffic and resist the erosive effects of weather.
30. Payment for “Wall Type 2” shall be paid on the basis of price per linear foot (LF). The face of Wall Type 2 shall be ‘Face Brick Type 1’, matching the existing brick walls, according to the plans and specifications.
31. Payment for “Landscaping (Trees, Shrubs, Perennials, Groundcover, Turf, Seedmix, Mulch, Planting Soils, Berm Soils, Steel Edging, Root Barrier etc)” shall be paid for on a lump sum basis. This item includes cost of furnishing all labor, materials and equipment needed to install top soil, trees, shrubs, mulch, planting soils (for the shade trees, ornamental trees, shrubs, perennials, ground cover, rain garden, turf, seed mix and berm soils), steel edging, root barrier and any others items on the landscape plan sheets. All landscaping shall be installed per the plans and specifications. Fertilizer is considered subsidiary to this bid item. Additional work to restore the disturbed areas outside of the pay limits shown on the plans is subsidiary to Bid Proposal Items for the project. Watering and maintenance until the project is accepted by the Owner is considered subsidiary to this bid item.
32. Payment for “Irrigation” shall be paid for on a lump sum basis. This item includes labor, materials and equipment to install all parts of the irrigation system including the water services (backflow preventer, boxes, heads, controller, meters, valves, piping, freeze sensor, etc.) shown on the irrigation plans and specifications.
33. Payment for “Lighting” shall be paid for on a lump sum basis and shall include Equipment Rack, Main Breaker, Surge Protection Device (SPD), Meter and Pedestal, Light Fixtures, Poles (varying height, see plans: 72 poles - 18’5.5” height from top to finished grade; and 2 poles 12’ 5.5” height from top to finished grade with pedestrian signal pushbuttons), Receptacles and Receptacle Transformers, Bulbs, Piers, Conduits and Cables, Fiber Optic Conduits (same trench as lighting), Large Handholes (1 Electrical and 1 Fiber), Small Lighting Handholes and Fiber Optic Handholes. Contractor is responsible for the electric bill until the City accepts the project. Contractor shall coordinate with Texas New Mexico Power, the electric utility company and the City to schedule inspections to have the meter set. Contractor shall pay a registration fee to register the work with the City. The City’s permit fee will be waived. The unit price shall include all labor, materials, tools, equipment and incidentals necessary to complete the work in accordance with the plans, specifications and details.

34. Payment for “4-inch Depth Topsoil and Block Sodding” will not be measured for payment. Payment will be made using the plan quantities given in the Bid Schedule for this item. The CONTRACTOR shall restore all disturbed areas by placing four-inch depth topsoil and establishing grass by sodding as shown on the plans. All private lawn areas will be restored with a variety of grass similar to that in the particular yard. Additional work to restore the disturbed areas outside of the pay limits shown on the plans is subsidiary to Bid Proposal Items for the project. All topsoil shall be from borrow sources. Fertilizer is considered subsidiary to this bid item.
35. Payment for “Flexible Base Measured in Place (Variable Depth)” shall be made on the basis of price per cubic yard. This bid item is intended to be used for Mill Street only where required within limits of proposed pavement to bring the base material to adequate grade prior to concrete pavement placement. Item shall conform with TxDOT Item 247, Flexible Base Type A, Grade 1 or 2. Payment will be based on the quantity actually used and measured in areas as field identified by the City Engineer and/or the City Inspector.

D. Special Specifications

1. Shop Drawings:

The CONTRACTOR shall submit three copies of shop drawings to the OWNER for all proposed materials including concrete mix designs. CONTRACTOR shall keep one (1) set of prints for making construction notes and mark-ups for submittal of as-built drawings.

2. **Property Owner Notification/Approval:**

The Contractor must notify all affected property owners 30 days prior to accessing the property. Notification must be made by certified mail with a copy of the letter, certified mail receipt and domestic return receipt submitted to the City. The CONTRACTOR shall obtain a written letter of approval from the affected property owners prior to city acceptance of the work.

3. Inspection:

The word “inspection” or other forms of the word, as used in the contract documents for this project shall be understood as meaning the OWNER’S Representative will observe the construction on behalf of the OWNER. The OWNER’S Representative will observe and check the construction in sufficient detail to satisfy himself that the work is proceeding in general accordance with the contract documents, but he will not be a guarantor of the CONTRACTOR’S performance.

4. “Street Construction Ahead” and “End Construction” signs shall be installed in accordance with Figure 6-1 (Rural District) of the “Texas Manual on Uniform Traffic Control Devices”, latest edition and the traffic control plans. Some signs may have to be relocated during construction. The exact locations will be determined by the OWNER. The CONTRACTOR shall provide flagmen to protect the public in accordance with all governing laws and regulations. The installation of “Street Construction Ahead,” “Utility Construction Ahead” and “End Construction” signs shall be made and such approved at least 48 hours prior to any construction or the moving of any equipment or materials onto or nearby the site.
5. Construction signing shall be placed on new 4” X 4” wooden posts (two required except “Street Construction Ahead” may be on one post). Upon post removal, the holes shall be filled and compacted. Signs shall be new.
6. Street signs shall be mounted in accordance with TxDOT standard details. All posts and hardware shall be galvanized in accordance with Item 445 – Galvanizing, contained in the Standard Specifications for Construction of Highways, Streets, and Bridges, published by the Texas Department of Transportation.
7. The CONTRACTOR shall provide detour signs, barricades, barrels, vertical panels, flashing lights, construction pavement markers, construction and maintenance signs, construction lights, construction speed limit signs, channelizing devices, and flagmen as required providing for the safety of the traveling public. These items shall be in accordance with the traffic control plan and the recommended practices of the “Texas Manual on Uniform Traffic Control Devices for Streets and Highways”, latest edition.

Flashing light panel board signs or changeable message board signs shall be placed at locations to be determined by the City Inspector and moved at his discretion during construction.

8. The CONTRACTOR shall provide two (2) project signs at the site with active construction, the cost of which will be subsidiary to the various bid items. Signs will be installed as directed by the City. The City will provide the CONTRACTOR with information with regards to the size of lettering, content, and size of signs (see detail at back of spec book). The two project signs shall be relocated, as directed by the City, as the work locations progress within each stage of construction.
9. Construction signing shall not be removed from the project until approved by the OWNER.
10. No street shall be closed except upon written authority from the OWNER.
11. The CONTRACTOR shall remove all trees, stumps, vegetation, roots, brush, logs, shrubs, plants, and landscaping within the right-of-way. All trees, stumps, slashings, brush, other debris or deleterious material generated as a part of this work shall be removed from the project. Any required disposal permits shall be in the sole responsibility of the CONTRACTOR. All stumps shall be grounded to below the finished grade, using a stump grinder. Tree branches that overhang into the right-of-way shall be trimmed by the CONTRACTOR, if required, to facilitate the construction. Tree removal or trimming shall be paid for as a part of the bid item "Prepare Right of Way".

Trees to remain will be protected from damage by the CONTRACTOR. Employees of the CONTRACTOR (his subcontractors) will not park closer than ten (10) feet to any tree that is to remain.
12. The CONTRACTOR shall coordinate his activities with other CONTRACTOR'S working within, and close proximity to the project. To facilitate cooperation, regular progress meetings will be held among all CONTRACTOR'S.
13. Water and sanitary sewer service shall be maintained for all properties during construction. This includes the construction of temporary connections, if required. Temporary connections shall be considered subsidiary to the various bid items.
14. At the end of each day, the CONTRACTOR shall prepare the work to the satisfaction of the OWNER to leave a safe and accessible job site.
15. Prior to beginning construction, the CONTRACTOR shall contact all utility companies with utilities in the area and the property owners, 48 hours in advance of starting work. If necessary, test ditches will be dug to verify actual locations and conditions.

Atmos Energy	214-206-2717
Texas-New Mexico Power Company	972-353-5006
Oncor Electric	817-868-2575
AT&T	214-745-2976
Spectrum (formerly Time Warner Cable).....	469-464-4993
Frontier Communications	940-381-9273
Verizon.....	972-318-0264
City of Lewisville Public Services	
Attn: Ron Carson	972-219-3525

United States Post Office 800-275-8777
 For line locates, call 1-800-DIG-TESS (1-800-233-8377)

16. Information shown on these plans concerning type and location of underground utilities is not guaranteed to be accurate or all-inclusive. The CONTRACTOR is responsible for making his own determination as to type and location of underground utilities as may be necessary to avoid damage thereto. The CONTRACTOR shall verify location of underground pipelines, conduits and structures by contacting the owners of the underground facilities and prospecting in advance of excavation operations. The CONTRACTOR shall pay for all repairs resulting from the construction of this project and no additional payment will be made by the CITY.

Furthermore, whenever the OWNER requests the CONTRACTOR to uncover any water line, sewer line or pipe line, or any other underground utility line well in advance of his construction activity in order to confirm locations of utilities, the CONTRACTOR shall comply with the OWNER’S request.

17. Boundary fences or other improvements removed to permit this construction shall be replaced in the same location or at the proposed ROW, as specified on the plans. Temporary fencing shall be installed as required. Cost of temporary fencing is incidental to contract bid items.
18. The CONTRACTOR shall at all times keep the job site as free from all material, debris and rubbish as is practical and shall remove same from any portion of the job site as construction of that portion is completed. No item of work will be considered complete for payment purposes until required cleanup has been performed.

Upon completion of the work, the CONTRACTOR shall remove from the site all plants, materials, tools and equipment belonging to him and leave the site with an acceptable appearance.

19. No material, which has been used by the CONTRACTOR for any temporary purpose whatever, is to be incorporated in the permanent structure without written consent of the CITY.

Where materials or equipment are specified by a trade or brand name, it is not the intention of the OWNER to discriminate against an equal product of another manufacturer, but rather to set a definite standard of quality of performance, and to establish an equal basis for the evaluation of bids. Where words “equivalent”, “proper”, or “equal to” are used, they shall be understood to mean that the thing referred to shall be proper, the equivalent to, or equal to some other thing, in the opinion or judgment of the ENGINEER. Unless otherwise specified, all materials shall be the best of their respective kinds and shall be in all cases fully equal to approved samples. Notwithstanding that the words “or equal to” or other such expressions may be used in the specifications in connection with a material, article or process specifically designated shall be used, unless a substitute shall be approved in writing by the ENGINEER, and the ENGINEER shall have the right to require the use of such specifically designated material, article or process.

20. Tree Protection

The CONTRACTOR shall be responsible for taking measures to minimize damage to tree limbs, tree trunks, and tree roots adjacent to the project unless otherwise specified in the plans to remove trees. CONTRACTOR shall inspect the work site in advance and arrange to have any tree limbs pruned that might be damaged by equipment operations. The City shall be notified at least 24 hours prior to any tree trimming work. Nothing shall be stored or parked over the tree root system within the drip line area of any tree. The CONTRACTOR shall employ a qualified landscaper for all the work required for tree care to ensure utilization of the best agricultural practices and procedures.

21. The CONTRACTOR'S attention is directed to the requirement by Item 505.1 Open Cut – General Conduit Installation in the Standard Specifications for Public Works Construction. Specifically the last paragraph of 505.1.6 the CONTRACTOR is required to provide, and to install at the end of each working day or when work is suspended, a temporary plug or watertight seal in the end of the utility main being installed under this contract. All caps (plugs) used shall be manufactured by the supplier of the pipe being used, or approved equal.

22. The CONTRACTOR is responsible for the preparation and proper execution of a Trench/Excavation Safety Program. This shall include submittal of a Shoring Plan prepared by a professional engineer licensed in the state of Texas. Trench safety and excavation systems must meet all the requirements of the Occupational Safety and Health Administration's Standards in effect during the construction period for the project. This work is subsidiary to all bid items.

23. The following material tests will be required for the project:

- a. Trench Backfill Compaction: All trench backfill under roadbed areas shall be mechanically compacted as required by North Central Texas Council of Governments Specifications and these special site specific specifications. The testing laboratory will make tests of in-place density in accordance with ASTM D 698 of points selected by the City Inspector. All trenches shall be compacted to 95% of standard Proctor maximum dry density within the range of 1% below and 3% above the material's optimum moisture content. A minimum of one density test will be made for each 100 linear feet of every 8 inch loose lift of fill for water, storm drain and sanitary sewer construction. When backfill tested fails to meet the required density, trench backfill in the vicinity of the test, i.e. for a minimum of 50 feet in both directions from the test location, shall be removed and replaced with compaction. Thereafter, three tests shall be performed on the material removed and replaced, to determine if it is in accordance with the project compaction requirements.
- b. Pavement Subgrade: The testing laboratory will make tests of in-place subgrade density in accordance with ASTM D 2922-81 at points selected by the City Inspector. A minimum of one field density test shall be conducted per lift for each 5,000 square feet of pavement subgrade.
- c. Roadway Embankment: The testing laboratory will make tests of in-place density in accordance with ASTM D 6938-08 of points selected by the City Inspector. A

- minimum of two field density tests shall be conducted per lift for each 5,000 square feet of compacted area, except that in critical areas such as around and over structures, the frequency of tests may be reduced to one test per 2,500 square feet.
- d. Concrete: Four standard 6-inch test cylinders shall be made from each type or strength of concrete for each pouring operation, but not less than five cylinders from each 100 yards of concrete placed. For twenty-eight (28) day concrete test cylinders shall be made and cured, as prescribed by ASTM Specification C-31, and broken, one at seven (7) days, two at twenty-eight (28) days, and hold one, as prescribed by ASTM Specification C-39. For three (3) day concrete test cylinders shall be made and cured, as prescribed by ASTM Specification C-31, and broken, two at three (3) days, one at seven (7) days, and hold one, as prescribed by ASTM Specification C-39.
 - e. Pavement Thickness Test: The CONTRACTOR shall have the new pavement cored (1-inch diameter) for thickness testing. In addition to the number of cores for pavement testing, one core shall be required at each area that is hand-poured pavement. The CONTRACTOR shall pay the cost of coring pavement. A City inspector must be present when coring is performed. The OWNER shall determine the locations for taking cores.
24. Existing concrete pavement, sidewalks, driveways, curb, asphalt pavement, curb and gutter, or concrete channel paving to be removed, shall be sawed along neat lines where portions are to be left in place. When sidewalks must be removed, full panels shall be removed and then replaced.
 25. The CONTRACTOR shall furnish and install permanent pavement markings at locations as shown on the plans. The elimination of existing raised pavement markers and markings, and the surface preparation required prior to installation of new signs and markings shall be considered subsidiary to the bid item for "Pavement Markings and Signage". All pavement markings and signs will be in accordance with the Texas Department of Transportation (TxDOT) Standard Specifications for the Construction of Highways, Streets, and Bridges, as well as in accordance with TxDOT standard drawings for signs. Wood shall not be used in the construction of permanent signs or their supports.
 26. Valves, fire hydrants, meter boxes, and cleanouts shall be located outside the future sidewalk areas.
 27. Positive drainage shall be established during the initial phase of grading and maintained throughout construction. Any softening or saturation of any lift will necessitate removal and replacement of the affected area. Where surface drainage channels are blocked during construction, they shall be restored to their original grade and cross-section.
 28. Delays associated with delivery of materials by the manufacturer will not be considered for any extension of contract time. It shall be the sole responsibility of the CONTRACTOR to assure that the materials are manufactured and delivered on time.

29. Flexible Base

Flexible Base shall be in accordance with TxDot Item 247, Type A, Grade 1 material and meet the requirements shown within Table 1 of TxDot Item 247. Uncontaminated and uniform quality material shall meet the requirements of the plans, Item 247, and come from an approved site. The use of fillers or binders is not allowed. Crushed stone produced and graded from oversize quarried aggregate that originates from a single, naturally occurring source shall be used – no gravel or multiple source aggregate shall be allowed. The Contractor shall submit samples of the material for approval prior to use. Delivery tickets shall be furnished to the City for each load of material. The ticket shall state the source of the material.

30. All trench backfill under roadbed areas shall be mechanically compacted as required by North Central Texas Council of Governments Specifications.

31. Conduits shown for irrigation and electric lines shall be buried a minimum of 30” to the top of conduit. The two conduits may be in the same trench and shall have mule tape installed within each conduit.

32. Construction Sequencing and Temporary Traffic Control

Construction sequence for this project shall be implemented as follows:

- a. Construction of Main Street improvements shall occur first. The construction on Main Street shall begin at the Mill Street intersection and then proceed eastward to the project limits on Main Street as indicated on the traffic control plans.
- b. Construction of the Main Street and Mill Street intersection shall be phased so that at least one travel lane is open to vehicular traffic both on Main Street and Mill Street respectively.
- c. Construction of Mill Street improvements shall commence only after the substantial completion of all construction activities on Main Street i.e. all paving work on Main Street must be 100% complete with all travel lanes open to traffic but work outside the curb is still ongoing. After commencement of construction work on Mill Street, contractor needs to continuously work on Main Street and must finish all work on Main Street within 90 days of the commencement of construction work on Mill Street including landscaping, irrigation, street lighting, installation of street amenities and related appurtenances.
- d. Construction of the Main Street and Charles Street intersection shall be sequenced such that it does not conflict with the construction of Main Street and Mill Street intersection to reduce the traffic impact on eastbound Main Street.
- e. Construction of the Charles Street and Church Street intersection improvements shall be sequenced such that it does not conflict with the construction of the Mill Street and Church Street intersection to reduce the traffic impact on westbound Church Street.
- f. During the ‘Western Days’ festival in 2019 on Friday, September 27th, 2019 and on Saturday, September 28th, 2019, Mill Street between the limits of Elm Street and Walters Street must be free of construction with no construction vehicles. However, on

these days, construction work can still proceed on Mill Street between Elm Street and Purnell Street.

Access to properties along construction limits must be maintained at all times. The CONTRACTOR shall place flexbase and steel plates to insure all-weather access to properties, including after working hours and during weekends and holidays. This cost shall be considered subsidiary to various bid items.

The construction sequencing and traffic control plans shown on the construction plans shall be considered the minimum requirements necessary to construct the project. Additional measures may be needed to address local traffic control issues and additional sequencing not covered by the construction plans. Prior to construction, the CONTRACTOR will be required to submit a detailed construction sequencing and temporary traffic control plan to address all issues not covered by the construction plans. A schedule shall also be submitted to address times of completion of each stage of the construction sequence and projected dates of road closings, detours, and utility interruptions. The CONTRACTOR shall update this schedule on a monthly basis.

The construction schedule shall address measures to be taken in the event of heavy rain or wet weather during construction. If, in the opinion of the City, wet weather renders unpaved streets or driveways impassable to traffic or prevents access to adjacent property by residents, the Contractor shall place gravel or crushed stone in the streets. The cost of furnishing or placing such materials shall be incidental to the unit cost of the various items of construction. Contractor's personnel shall be on call 24 hours a day to handle wet weather problems.

Proper notification must be given to all affected property owners at least 48 hours in advance of all construction operations **including saw cutting**.

No street shall be closed except upon written authority from the OWNER.

The Contractor shall provide all barricades, signing, and traffic control devices required for maintaining traffic flow.

At the end of each day, trenches shall be backfilled and streets maintained in an all-weather condition by the addition of asphalt millings, crushed stone or other means approved by the Engineer when permanent pavement is not in place. The temporary surface shall be maintained until permanent pavement is placed. This work shall be subsidiary to the Proposal Bid Items.

Construction signing shall not be removed from the project until approved by the OWNER. **Construction signing shall be maintained in good working condition throughout the duration of the project.**

33. **Block Sodding with 4-Inch Depth Topsoil**

Item 202.2 Topsoil and Item 202.6 Seeding of the Standard Specifications area hereby deleted and replaced with this specification. Item 202.4 Fertilizer is hereby revised as indicated below.

- a. Description – The CONTRACTOR shall provide topsoil and block sod to all designated areas. The CONTRACTOR shall water, mow and protect the sodded areas

until acceptance. Acceptance will not be made until all sodded areas are in full growth with a well established root system. **No on-site topsoil shall be used for establishing grass. The CONTRACTOR shall provide imported topsoil obtained from a commercial source.**

- b. Preparation of Areas – All areas to receive topsoil and sod shall be graded to the lines, grades and cross-sections shown on the plans and as provided for in other items of this contract, with the surface grade set four (4) inches low to allow for the placement of 4-inch depth topsoil plus sod. All rocks and foreign material shall be raked off the surface prior to the placement of topsoil.
- c. **Imported Topsoil - Imported topsoil shall be obtained from an approved commercial source. Topsoil shall consist of natural, fertile, friable, screened, dark-colored sandy loam. It shall contain no acidity or alkalinity detrimental to plant growth. It shall contain no subsoil, lumps, stones, roots or other foreign matter.**
- d. Grass Type –Sod shall be of the same type as on areas adjacent to the area being sodded.
- e. Block Sodding – Sod blocks shall be carefully placed on the prepared areas. Sod shall be so placed that the entire designated area and disturbed areas shall be covered. Any voids left in the block sod shall be filled with additional sod and tamped. The entire sodded areas shall be rolled and tamped to form a thoroughly compact solid mass. When necessary the sodded areas shall be smoothed after planting has been completed and shaped to conform to the cross-section. Any excess dirt shall be removed to give a neat appearance.
- f. Fertilizer – Fertilizer shall conform to the requirements of Item 202.4, Fertilizer of the Standard Specifications. Fertilizer shall be applied at the rate of 400 pounds/acre and be considered subsidiary to bid item “4” Topsoil and Sodding”. Section 202.4.4, Measurement and Payment is hereby deleted.
- g. Watering – Sodded areas shall be watered by the CONTRACTOR as required to promote rapid growth of grass without unnecessary delay. **The CONTRACTOR shall install a temporary irrigation system to water the grass in areas not covered by a permanent irrigation system.** Re-sodding shall be performed immediately, when required, without delay. Temporary irrigation, re-sodding, and replacing eroded topsoil are incidental to the contract.
- h. Acceptance – The CITY will accept sodding as complete upon establishment of a growth of grass covering all areas requiring seeding. The CONTRACTOR shall mow and maintain the grass until accepted.
- i. Payment – Payment will be per plan quantity. No measurement will be made.

Topsoil, sod and fertilizer required in areas disturbed by the CONTRACTOR outside of the designated areas shall be incidental to the project and not paid for separately. **The CONTRACTOR shall pay for all water costs until grass is accepted by the CITY.**

34. **Reinforced Concrete Paving for Streets, Driveways and Sidewalk**

Reinforced concrete pavement shall be installed in accordance with the construction plans and Item 303 of the Standard Specifications. Concrete for paving streets, alleys, and

driveways shall have a minimum compressive strength of 3,750 PSI at 14 days. The Contractor shall use a “high early strength” design mix for use at colored concrete (stained) crosswalks and street intersections. “High early strength” concrete should be obtained with higher cement content. **High early strength concrete is required for street pavement at the intersections and for the colored concrete (stained) crosswalks in accordance with the plans and shall have a minimum compressive strength of 4200 PSI at 3 days.** Sidewalks shall have a minimum compressive strength of 3,000 PSI. **No super plasticizers will be allowed in concrete mixes.** The minimum cement ratio shall be 6.0 sacks per cubic yard for 3,750 PSI concrete and 8.0 sacks per cubic yard for 4200 PSI high early strength concrete. **Fly ash will not be permitted in concrete on the project.** Bar chairs area required to support reinforcing steel and dowel bars. Hand finish of concrete pavement will not be a separate pay item on the project.

Reinforcing steel shall be 60-ksi steel, **No. 4 bars placed on 18-inch center-to-center** spacing each way. All work required for joints (including anchor joints), sawcutting joints and joint sealant is included in these items.

Maximum joint spacing shall be 15 feet.

The CONTRACTOR shall **submit mix designs** and concrete break histories for approval prior to construction

35. **Conduit**

4” Schedule 40 PVC conduit shall be installed per TxDOT Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges Item 618 and per the plans. Measurement and payment shall be per Linear Foot.

36. **Storm Water Prevention Pollution Plan (SWPPP)**

It shall be the full responsibility of the CONTRACTOR to acquire and comply with any and all permits as may be required to avoid delay of the project.

Prior to construction, the CONTRACTOR shall comply with Federal and State storm water management regulations. The plan shall employ measures to prevent erosion and siltation from the construction disturbance from reaching stream beds, channels, storm water structures, ponds, etc. The plan shall comply with the requirements of the “Integrated Storm Water Management Design Manual for Construction” published by NCTCOG. In the event of a conflict between these requirements and Federal and State pollution control laws, rules, and regulations or other Federal, State or Local agency laws, rules, and regulations, the more restrictive shall apply. The release of the plan for construction by the CITY in no way relinquishes the CONTRACTOR of all responsibility and liability for the pollution control. The CONTRACTOR shall be sole responsible and liable for all activities at the construction site necessary for compliance with Federal and State storm water regulations and the Storm Water Pollution Prevention Plan for the site.

The SWPP shall conform to the following City of Lewisville requirements:

- a. All site specific information required by the TCEQ Construction General Permit (Part III, Section F) must be included in the SWPPP. Restatement of information directly from the Construction General Permit is not acceptable. The CONTRACTOR must describe specifically what measures are planned at the construction site.

- b. All signature documents must be signed and dated prior to submittal for review. This includes SWPPP certifications, Notices of Intent (NOI), Construction Site Notices, and Inspector Delegation Letters. If there are multiple Operators for the project, each Operator's signature documents must be signed and dated. The City of Lewisville will complete its own signature documents during the review process. All forms must be signed by an appropriate signatory authority, and include the person's job title, where required. SWPPPS without the proper signatures will be returned without review.
- c. The specific inspection schedule must be described in the SWPPP. The CONTRACTOR must clearly state whether he will be implementing the 14-day (and within 24 hours after a ½ inch rainfall) schedule, or the 7-day schedule.
- d. The CONTRACTOR must include a copy of the inspection form that will be used. The form must include the required certification statement and allow for signature by the inspector, as required by the Construction General Permit.
- e. The SWPPP must include a section in which to document the dates of the following activities: when major grading activities occur; when construction activities temporarily or permanently cease on a portion of the site; the dates when stabilization measures are initiated. If there is no section for this information, the CONTRACTOR must document the information on the inspection reports, and the CONTRACTOR must state in the SWPPP that the information will be documented in this manner.
- f. The SWPPP must describe what types of temporary and/or permanent stabilization will be implemented at the site. For example, if the plan is to seed the disturbed area and maintain it until a uniform, established vegetative growth is achieved, then this must be detailed in the SWPPP.
- g. The CONTRACTOR must identify the erosion and sediment controls that are planned at the site, including sweeping activities. All structural controls (i.e. silt fence, check dams, rock entrances) must be shown on the site map. The CONTRACTOR must also describe how he plans to maintain those erosion and sediment controls in proper working order.
- h. The SWPPP must include both a General Vicinity Map and a Detailed Site Map. The site map must include all of the information listed in Part III, Section F (g) of the Construction General Permit. The CONTRACTOR may use the Erosion Control map from the Construction Plans, provided that it includes all of the necessary information. It is recommended that a separate site map be developed for the SWPPP, to avoid deficiencies.
- i. The SWPPP must clearly state whether or not any support activities, such as concrete or batch plants, are planned. This is because support activities do not always qualify for coverage under the Construction General Permit, and separate permit coverage may be necessary.
- j. If the project disturbs 10 acres or more with a common drainage location, and a sediment basin is not employed, the rationale for this decision must be documented in the SWPPP. The equivalent erosion and sediment control devices that are to be used must be described.

- k. Allow a minimum of 2 days for review of the SWPPP.
- l. The City of Lewisville does not currently utilize electronic submittal of Notices of Intent. **Construction will not be allowed to begin until 7 days after the NOI has been signed by the signatory authority and postmarked for delivery.** For this reason, early submission of the SWPPP and NOI are highly recommended.
- m. At least two copies of the completed SWPPP must be submitted to the City. One copy will be maintained by the Storm Water Division, and one other copy will be reviewed and returned to the CONTRACTOR.

The cost to the CONTRACTOR for the preparation of the SWPPP for the project shall be incidental to the various items of erosion control. The erosion control plan included in the project construction plans shall be incorporated into the SWPPP. Items required by the SWPPP that are not included as bid items are subsidiary to the various items of erosion control. The various bid items for erosion control shall include all costs for implementing and maintaining the Storm Water Pollution Prevention Plan, from the beginning of construction through final acceptance and establishment of grass coverage.

Any disturbed areas, whether inside or outside the project limits, where construction activities are complete or won't be worked on for 14 days, must be permanently or temporarily stabilized. **Stabilization measures must be initiated no later than one day after completing work in an area or determining that work will be temporarily stopped for more than 14 days in that area.** Temporary stabilization can include the use of erosion blankets such as Curlex or other methods approved by the City inspector. Permanent stabilization will require topsoil and sod, unless otherwise shown on the project landscaping plans.

Final acceptance of sodded areas will be granted when sod has taken root. Placement of temporary or permanent erosion control measures in unstabilized areas after contract time has expired will be considered subsidiary to this bid item. Once final acceptance of permanent stabilized areas is granted, **the Contractor shall notify the City inspector prior to removing the Construction Site Notice sign and submit the final copy to the City within one week of removal.**

37. Fire Hydrant Specifications

a. General Specifications

- 1) All fire hydrants shall comply with AWWA C-502 for dry barrel fire hydrants.
- 2) All fire hydrants shall be compression type, closing with the line pressure. The valve opening shall be 5 1/4-inch only.
- 3) All fire hydrants shall have an oil compatible sealed lubrication reservoir and be furnished with biodegradable grease or oil from the point of manufacture.
- 4) All fire hydrants shall have a one-piece bronze operating nut 1 1/2-inch pentagon point to flat. The operating nut may be fully covered with a cast-iron weather shield and protection device measuring 1 1/2-inch pentagon point to flat to protect the bronze operating nut when opening and closing the hydrant.

- 5) All fire hydrants shall be furnished with a breakable flange traffic feature, one that permits a full 360-degree rotation of the hydrant nozzle section. Unnotched electroplated bolts and nuts must be used to retain the safety flange that connects the nozzle section to the lower barrel. Traffic flange repairs and other maintenance will not require Allen wrenches to accomplish.
- 6) The interior and exterior of the hydrant shoe shall be "fusion-bonded" with an epoxy coating. All other methods are unacceptable. A minimum of four stainless steel bolts and nuts shall secure the hydrant shoe to the lower barrel.
- 7) All hydrants shall be able to deliver the required flow with a friction loss not to exceed 5 PSIG at 1000 GPM, as per AWWA test procedure. Certification of this standard shall be furnished from an independent testing laboratory prior to approval. All tests must be performed at the testing company's own facilities.
- 8) All fire hydrants shall be designed for 200 PSI working pressure and tested to 400 PSI hydrostatic pressure.
- 9) All fire hydrants shall drain automatically when the main valve is closed and shall be an integral part of the main valve. Drain valves that operate by toggles, springs, or adjustable mechanisms are unacceptable. The upper plate shall be of bronze and incorporate two hard rubber drain facings that activate the drain ports, or a drain tube with all bronze cross-arm and fusion bond washer. The drain facings shall be attached to the upper valve plate with stainless steel screws or rolled pins. Other methods of attachment are unacceptable.
- 10) All fire hydrants shall have a field replaceable bronze main valve seat threaded into a bronze drain ring.
- 11) The main valve rubber shall be positioned between a bronze upper valve plate and bronze cross arm, and a fusion bond epoxy lower valve plate, and be field replaceable.
- 12) All fire hydrants shall have two (2) 2 1/2-inch hose nozzles and one (1) 4 1/2-inch pumper nozzle. All threads shall be National Standard. All nozzles shall have o-ring seals. The nozzles shall be threaded and/or mechanically attached into the nozzle section and locked. Threads are to be NST.
- 13) All fire hydrants shall have a warranty of not less than five (5) years. A copy of the warranty must be submitted prior to approval.
- 14) All fire hydrants shall be able to be opened in a counter-clockwise direction.
- 15) All fire hydrants and hydrant components shall be of domestic (U.S.A.) manufacture and assembly.
- 16) Fire hydrants shall be painted with a minimum of two (2) primer coats. The final coat of paint on all hydrants shall be a silver color of an approved aluminum paint.

b. Special Conditions

- 1) The City of Lewisville will approve no more than one (1) model/unit per manufacturer and/or ownership for use within the City.

- 2) Manufacturers shall have a minimum of ten (10) years of manufacturing experience in the U.S.A.
- 3) Parts shall be available locally from a minimum of two (2) authorized distributors.
- 4) Fire hydrants known to meet the above specifications are the **Mueller Super Centurion**, the **Clow Medallion**, and the **Waterous WB-67**.

38. **Storm Drain Inspection**

Contractor shall perform pre and post construction television inspection of all storm lines in the project area improved or subject to siltation to determine existing conditions and required restoration post construction.

39. **Traffic Signals:** Traffic signal installation shall comply with the plans and TxDOT specifications. This item includes the cost to remove the existing signals once the proposed traffic signals have been installed, tested and functioning. All existing traffic signal related appurtenances include, but not limited to, traffic signal poles, traffic signal heads, LED's and signs. All items shall be delivered to the City of Lewisville Public Services storage yard at 1100 North Kealy Ave. in the City of Lewisville.

40. **Water for Construction**

Water will be furnished free of charge by the OWNER to the CONTRACTOR in the amounts needed to properly fill and test the water line. The owner reserves the right, however, to charge the prevailing rate for water wasted through carelessness or neglect on the part of the CONTRACTOR. All other water required for the project will be at the CONTRACTOR'S expense. The CONTRACTOR shall obtain a temporary water meter (deposit reimbursed when the meter is returned) from the OWNER and meter all water used for the project.

41. **Prevailing Wage Rate Determination**

The General Services Commission has adopted the Federal Davis-Bacon wage rates for our use.



General Services Commission

1711 San Jacinto - P.O. Box 13047

Austin, Texas 78711-3047

Web Site: www.gsc.state.tx.us

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Gene Shull
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Tom Treadway

Prevailing Wage Rate Determination Information

The following information from Chapter 2258 Texas Government Code Title 10 should be included in your bid specification documents and contract documents:

2258.021. Duty of Governmental Entity to Pay Prevailing Wage Rates

- (a) The state or any political subdivision of the state shall pay a worker employed by it or on behalf of it:
 - (1) not less than the general prevailing rate of per diem wages for work of a similar character in the locality in which the work is performed; and
 - (2) not less than the general prevailing rate of per diem wages for legal holiday and overtime work.
- (b) Subsection (a) does not apply to maintenance work.
- (c) A worker is employed on a public work for the purposes of this section if the worker is employed by a contractor or subcontractor in the execution of a contract for the public work with the state, a political subdivision of the state, or any officer or public body of the state or a political subdivision of the state.

2258.023. Prevailing Wage Rates to be Paid by Contractor and Subcontractor; Penalty

- (a) The contractor who is awarded a contract by a public body or a subcontractor of the contractor shall pay not less than the rates determined under Section 2258.022 to a worker employed by it in the execution of the contract.
- (b) A contractor or subcontractor who violates this section **shall** pay to the state or a political subdivision of the state on whose behalf the contract is made, \$60 for each worker employed for each calendar day or part of the day that the worker is paid less than the wage rates stipulated in the contract. A public body awarding a contract shall specify this penalty in the contract.
Note: This penalty applies even if the contractor or subcontractor and the worker come to an agreement on the underpaid wages (see Attorney General Opinion DM-469).
- (c) A contractor or subcontractor does not violate this section if a public body awarding a contract does not determine the prevailing wage rates and specify the rates in the contract as provided by Section 2258.022.
- (d) The public body shall use any money collected under this section to offset the costs incurred in the administration of this chapter.
- (e) A municipality is entitled to collect a penalty under this section only if the municipality has a population of more than 10,000.

2258.051. Duty of Public Body to Hear Complaints and Withhold Payment

- (a) A public body awarding a contract, and an agent or officer of the public body, shall:
 - (1) take cognizance of complaints of all violations of this chapter committed in the execution of the contract; and
 - (2) withhold money forfeited or required to be withheld under this chapter from the payments to the contractor under the contract, except that the public body may not withhold money from other than the final payment without determination by the public body that there is good cause to believe that the contractor has violated this chapter.

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TEMPORARY TREE AND PLANT PROTECTION**SECTION 015639****PART 1 - GENERAL****1) RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract.

2) SUMMARY

- A. Section includes general protection of existing trees and plants that are affected by execution of the Work, whether temporary or permanent construction.

3) DEFINITIONS

- A. Caliper: Diameter of a trunk measured by a diameter tape at a height 6 inches (150 mm) above the ground for trees up to and including 4-inch (100-mm) size at this height and as measured at a height of 12 inches (300 mm) above the ground for trees larger than 4-inch (100-mm) size.
- B. Plant-Protection Zone: Area surrounding individual trees, groups of trees, shrubs, or other vegetation to be protected during construction and indicated on Drawings.
- C. Tree-Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction and indicated on Drawings.
- D. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

4) ACTION SUBMITTALS

- A. Product Data: For each type of fencing called out in details for review and approval by Landscape Architect.
- B. Shop Drawings:
 - 1. Indicate extent of trenching by hand or with air spade within protection zones.
- C. Samples: For each type of the following:
 - 1. Protection-Zone Fencing: Assembled Samples of manufacturer's standard size made from full-size components at a minimum of 12 in. x 12 in.
 - 2. Description of maintenance following pruning.

5) INFORMATIONAL SUBMITTALS

- A. 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.
- B. Maintenance Recommendations: From arborist, for care and protection of trees affected by construction during and after completing the Work.
- C. Existing Conditions: Documentation of existing trees and plantings indicated to remain, which establishes preconstruction conditions that might be misconstrued as damage caused by construction activities.
 - 1. Use sufficiently detailed photographs.
 - 2. Include plans and notations to indicate specific wounds and damage conditions of each tree or other plants designated to remain, should trees be damaged prior to the start of construction.

6) QUALITY ASSURANCE

- A. Arborist Qualifications: City of Lewisville Licensed Arborist or ISA Certified.

7) FIELD CONDITIONS

- A. The following practices are prohibited within protection zones:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Moving or parking vehicles or equipment.
 - 3. Foot traffic.
 - 4. Erection of sheds or structures.
 - 5. Impoundment of water.
 - 6. Excavation or other digging unless otherwise indicated.
 - 7. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- B. Broadcast water to remove construction dust from tree canopy should no more than 1” of rain fall within a two week period during construction.
- C. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones and organic mulch.

PART 2 - PRODUCTS

1) MATERIALS

1. Plastic Protection-Zone Fencing: Plastic construction fencing constructed of high-density extruded and stretched polyethylene fabric with 2-inch (50-mm) maximum opening in pattern and weighing a minimum of 0.4 lb/ft. (0.6 kg/m); remaining flexible from minus 60 to plus 200 deg F (minus 16 to plus 93 deg C); inert to most chemicals and acids; minimum tensile yield strength of 2000 psi (13.8 MPa) and ultimate tensile strength of 2680 psi (18.5 MPa); secured with plastic bands or galvanized-steel or stainless-steel wire ties; and supported by tubular or T-shape galvanized-steel posts spaced not more than 96 inches (2400 mm) apart.
 - a. Height: **48 inches**
 - b. Color: High-visibility orange, nonfading.

PART 3 - EXECUTION

1) EXAMINATION

- A. Erosion and Sedimentation Control: Examine the site to verify that temporary erosion-and sedimentation-control measures are in place. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- B. Prepare written report, endorsed by arborist, listing conditions detrimental to tree and plant protection.

2) PREPARATION

- A. Locate and clearly identify trees, shrubs, and other vegetation to remain Flag with pink flag or tie a 1-inch (25-mm) green vinyl tape around each tree trunk at 54 inches (1372 mm) above the ground.
- B. Protect tree root systems from damage caused by runoff or spillage of noxious materials while mixing, placing, or storing construction materials. Protect root systems from ponding, eroding, or excessive wetting caused by dewatering operations.

3) PROTECTION ZONES

- A. Protection-Zone Fencing: Install protection-zone fencing along edges of protection zones before materials or equipment are brought on the site and construction operations begin in a manner that will prevent people from easily entering protected areas except by

entrance gates. Construct fencing so as not to obstruct safe passage or visibility at vehicle intersections where fencing is located adjacent to pedestrian walkways or in close proximity to street intersections, drives, or other vehicular circulation.

1. Posts: Set or drive posts into ground one-third the total height of the fence without concrete footings. Where a post is located on existing paving or concrete to remain, provide appropriate means of post support acceptable to Architect.
 - B. Maintain protection zones free of trash.
 - C. Maintain protection-zone fencing in good condition as acceptable to Landscape Architect and Owner and remove when construction operations are complete and equipment has been removed from the site.
 1. Do not remove protection-zone fencing, even temporarily, to allow deliveries or equipment access through the protection zone.
- 4) EXCAVATION
- A. General: Excavate at edge of protection zones and for trenches indicated within protection zones according to requirements in Section 312000 "Earth Moving" unless otherwise indicated.
 - B. Trenching within Protection Zones: Where utility trenches are required within protection zones, excavate under or around tree roots by hand or with air spade, or tunnel under the roots by drilling, auger boring, or pipe jacking. Do not cut main lateral tree roots or taproots; cut only smaller roots that interfere with installation of utilities. Cut roots as required for root pruning. If excavating by hand, use narrow-tine spading forks to comb soil and expose roots.
 - C. Do not allow exposed roots to dry out before placing permanent backfill. Provide temporary earth cover or pack with peat moss and wrap with burlap. Water and maintain in a moist condition. Temporarily support and protect roots from damage until they are permanently relocated and covered with soil.
 1. Temporarily support and protect roots from damage until they are permanently redirected and covered with soil.
 2. Cover exposed roots with burlap and water regularly.
 3. Backfill as soon as possible according to requirements in Section 312000 "Earth Moving."
- 5) CROWN PRUNING
- A. Prune branches that are negatively affected by temporary and permanent construction. Prune branches as directed by arborist.

1. Prune to remove only injured, broken, dying, or dead branches unless otherwise indicated. Do not prune for shape.
 2. Do not remove or reduce living branches to compensate for root loss caused by damaging or cutting root system.
 3. Pruning Standards: Prune trees according to ANSI A300 (Part 1).
- B. Unless otherwise directed by arborist and acceptable to Landscape Architect, do not cut tree leaders.
- C. Cut branches with sharp pruning instruments; do not break or chop.
- D. Do not paint or apply sealants to wounds.
- E. Provide subsequent maintenance pruning during Contract period as recommended by arborist.
- 6) 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.
- 7) 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 Landscape Architect.
1. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Landscape Architect.
- B. Trees: Remove and replace trees indicated to remain that are damaged during construction operations that Landscape Architect determines are incapable of restoring to normal growth pattern.
1. Small Trees: Provide new trees of same size and species as those being replaced for each tree that measures 6 inches (150 mm) or smaller in caliper size.
 2. Large Trees: Per Owner's decision, provide a caliper inch match utilizing trees no less than 4 caliper inches or if the large tree is 16" or less, provide a replacement tree approved by Landscape Architect.

3. Plant and maintain new trees as specified in Section 329300 "Plants."

END OF SECTION 015639

CAST-IN-PLACE-CONCRETE**SECTION 033000****PART 4 - GENERAL****1) RELATED DOCUMENTS**

- A. Drawings and general provisions of the Contract.

2) SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes.
- B. Provide site concrete, including but not limited to, stairs, walls, footings and sub-slabs, complete, as shown and as specified. Structural and Civil engineering's specifications and drawings supersede these specifications. Finishes for concrete pavements are specified here.
- C. Related Requirements:
 - 1. Section 321313 "Concrete Paving" for concrete pavement and walks.

3) DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, other pozzolans, and silica fume; materials subject to compliance with requirements.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

4) ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.

- C. Steel Reinforcement Shop Drawings: Placing Drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 1. Location of construction joints is subject to approval of the Landscape Architect.

5) INFORMATIONAL SUBMITTALS

- A. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Curing compounds.
 - 6. Bonding agents.
 - 7. Adhesives.
 - 8. Vapor retarders.
 - 9. Repair materials.
- B. Material Test Reports: For the following, from a qualified testing agency:
 - 1. **Aggregates:** Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- C. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.
 - 1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.

6) QUALITY ASSURANCE

- A. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
- B. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

- C. Mockups: Cast concrete formed-surface panels to demonstrate typical joints, surface finish, texture, tolerances, floor treatments, and standard of workmanship.
 - 1. Build panel approximately 200 sq. ft. in the location indicated or, if not indicated, as directed by Landscape Architect.

- 7) PRECONSTRUCTION TESTING
 - A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on concrete mixtures.

- 8) DELIVERY, STORAGE, AND HANDLING
 - A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

- 9) FIELD CONDITIONS
 - A. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F (4.4 deg C) for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301 (ACI 301M).
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

 - B. Hot-Weather Placement: Comply with ACI 301 (ACI 301M) and ACI 305.1 (ACI 305.1M), and as follows:
 - 1. Maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 5 - PRODUCTS

1) CONCRETE, GENERAL

A. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301 (ACI 301M).
2. ACI 117 (ACI 117M).

2) FORM-FACING MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Plywood, metal, or other approved panel materials.
2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - c. Structural 1, B-B or better; mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.

3. Overlaid Finnish birch plywood.

B. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch (19 by 19 mm), minimum.

C. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.

D. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.

E. Form Ties: Factory-fabricated, removable or snap-off glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

1. Furnish units that leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.

- 3) STEEL REINFORCEMENT
 - A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.

- 4) CONCRETE MATERIALS
 - A. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
 - B. Cementitious Materials:
 1. Portland Cement: ASTM C 150/C 150M, **Type I, Type II.**
 - C. Water: ASTM C 94/C 94M and potable.

- 5) CURING MATERIALS
 - A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
 - B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
 - C. Water: Potable.
 - D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

- 6) CONCRETE MIXTURES, GENERAL
 - A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301 (ACI 301M).
 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

- 7) CONCRETE MIXING
 - A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M[**and ASTM C 1116/C 1116M**], and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 6 - EXECUTION

1) FORMWORK INSTALLATION

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301 (ACI 301M), to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 (ACI 117M).
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Construct forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 1. Install keyways, reglets, recesses, and the like, for easy removal.
 2. Do not use rust-stained steel form-facing material.
- F. Chamfer exterior corners and edges of permanently exposed concrete.
- G. Lightly broom finish the top surface of the wall.
- H. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- I. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.
- J. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

2) REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls may be removed after cumulatively curing.. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.

- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material are not acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Landscape Architect.
- D. Forms should not be used for more than two applications to ensure a uniform application.

3) SHORING AND RESHORING INSTALLATION

- A. Comply with ACI 318 (ACI 318M) and ACI 301 (ACI 301M) for design, installation, and removal of shoring and reshoring.
 - 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

4) VAPOR-RETARDER INSTALLATION

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.
- B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder according to manufacturer's written instructions.

5) STEEL REINFORCEMENT INSTALLATION

- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
 - D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
 - E. Install welded-wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.
 - F. Epoxy-Coated Reinforcement: Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963/D 3963M. Use epoxy-coated steel wire ties to fasten epoxy-coated steel reinforcement.
 - G. Zinc-Coated Reinforcement: Repair cut and damaged zinc coatings with zinc repair material according to ASTM A 780/A 780M. Use galvanized-steel wire ties to fasten zinc-coated steel reinforcement.
- 6) JOINTS
- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
 - 1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 2. Refer to Section 321313 – Concrete Paving
 - 3. Refer to Drawings for Concrete sidewalk joint layout.
- 7) CONCRETE PLACEMENT
- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections are completed.
 - B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Landscape Architect.
 - C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301 (ACI 301M).
 - D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
1. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
- 8) FINISHING FORMED SURFACES
- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
1. Apply to concrete surfaces not exposed to public view.
 2. Create a light broom finish on the top surfaces
- 9) CONCRETE PROTECTING AND CURING
- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305.1 (ACI 305.1M) for hot-weather protection during curing.
- 10) CONCRETE SURFACE REPAIRS
- A. Defective Concrete: Repair and patch defective areas when approved by Landscape Architect. Remove and replace concrete that cannot be repaired and patched to Landscape Architect's approval.
- B. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
- C. All surface repairs should be performed on a mockup or a surface to be concealed later, before attempting to repair visible surfaces. Landscape Architect or Owner should approve repair mock up prior to installation on visible surfaces.

END OF SECTION 033000

PRECAST ARCHITECTURAL CONCRETE**SECTION 034500**

SECTION 034500 - PRECAST ARCHITECTURAL CONCRETE

PART 7 - GENERAL

1) RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract.

2) SUMMARY

A. Section Includes:

- 1. Precast Wall Cap Units.

B. Related Requirements:

- 1. Section 033000 "Cast-in-Place Concrete" for installing connection anchors in concrete.
- 2. Section 042000 "Unit Masonry"
- 3. Detail 4.3 Wall Type 2, refer to drawings.

3) ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Design Mixtures: For each precast concrete mixture. Include compressive strength and water-absorption tests.

C. Shop Drawings:

- 1. Detail fabrication and installation of architectural precast concrete units.
- 2. Indicate locations, plans, elevations, dimensions, shapes, and cross sections of each unit.
- 3. Indicate joints, reveals, drips, chamfers, and extent and location of each surface finish.
- 4. Indicate details at wall corners.

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5. Indicate locations, tolerances, and details of anchorage devices to be embedded in or attached to wall.
- D. Samples: Design reference samples for initial verification of design intent, for each type of finish indicated on exposed surfaces of architectural precast concrete units, in sets of three, representative of finish, color, and texture variations expected; approximately 12 by 12 by 2 inches.
1. When other faces of precast concrete unit are exposed, include Samples illustrating workmanship, color, and texture of backup concrete as well as facing concrete.
 2. Samples for each thin-brick unit required, showing full range of color and texture expected. Include Sample showing color and texture of joint treatment.
 - a. Grout Samples for Initial Selection: Color charts consisting of actual sections of grout showing manufacturer's full range of colors.
 - b. Grout Samples for Verification: Showing color and texture of joint treatment.
- 4) INFORMATIONAL SUBMITTALS
- A. Qualification Data: For Installer, fabricator.
- 5) QUALITY ASSURANCE
- A. Installer Qualifications: A precast concrete erector who has retained a "PCI-Certified Field Auditor" to conduct a field audit of a project in same category as this Project and who can produce an Erectors' Post-Audit Declaration.
- B. Fabricator Qualifications: A firm that assumes responsibility for engineering architectural precast concrete units to comply with performance requirements. This responsibility includes preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.
1. Designated as a PCI-certified plant for Group A, Category A1 - Architectural Cladding and Load Bearing Units or designated as an APA-certified plant for production of architectural precast concrete products.
- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
- D. Quality-Control Standard: For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL 117, "Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products."

- E. Sample Panels: After sample approval and before fabricating architectural precast concrete units, produce a minimum of two sample panels for review by Architect. Incorporate full-scale details of architectural features, finishes, textures, and transitions in sample panels.
1. Locate panels where indicated or, if not indicated, as directed by Architect.
 2. Damage part of an exposed-face surface for each finish, color, and texture, and demonstrate adequacy of repair techniques proposed for repair of surface blemishes.
 3. After acceptance of repair technique, maintain one sample panel at manufacturer's plant and one at Project site in an undisturbed condition as a standard for judging the completed Work.
 4. Demolish and remove sample panels when directed.
- F. Mockups: After sample panel approval but before production of architectural precast concrete units, construct full-sized mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for materials and execution.
1. Build mockup as indicated on Drawings including and architectural precast concrete complete with anchors, connections, flashings, and joint fillers.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undamaged at time of Substantial Completion.
- 6) COORDINATION
- A. Furnish loose connection hardware and anchorage items to be embedded in or attached to other construction without delaying the Work. Provide locations, setting diagrams, templates, instructions, and directions, as required, for installation.
- 7) DELIVERY, STORAGE, AND HANDLING
- A. Deliver architectural precast concrete units in such quantities and at such times to limit unloading units temporarily on the ground or other rehandling.
- B. Support units during shipment on nonstaining shock-absorbing material.
- C. Store units with adequate dunnage and bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.
- D. Place stored units so identification marks are clearly visible, and units can be inspected.

- E. Handle and transport units in a manner that avoids excessive stresses that cause cracking or damage.
- F. Lift and support units only at designated points indicated on Shop Drawings.

PART 8 - PRODUCTS

1) MANUFACTURERS

- A. Contractor to submit list of fabricators to be approved by project Landscape Architect.

2) MOLD MATERIALS

- A. Form Liners: Units of face design, texture, arrangement, and configuration [**indicated**] [**to match those used for precast concrete design reference sample**]. Use with manufacturer's recommended form-release agent that does not bond with, stain, or adversely affect precast concrete surfaces and does not impair subsequent surface or joint treatments of precast concrete.

3) CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or Type III, gray, unless otherwise indicated.
 - 1. For surfaces exposed to view in finished structure, use gray or white cement, of same type, brand, and mill source.
- B. Supplementary Cementitious Materials:
 - 1. Fly Ash: ASTM C 618, Class C or F, with maximum loss on ignition of 3 percent.
 - 2. Metakaolin: ASTM C 618, Class N.
 - 3. Silica Fume: ASTM C 1240, with optional chemical and physical requirement.
 - 4. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
 - 5. Blended Hydraulic Cement: ASTM C 595, Type IS, portland blast-furnace cement.
- C. Water: Potable; free from deleterious material that may affect color stability, setting, or strength of concrete and complying with chemical limits of PCI MNL 117.
- D. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
- E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures and to not contain calcium chloride, or more than 0.15 percent chloride ions or other salts by weight of admixture.

1. Water-Reducing Admixtures: ASTM C 494/C 494M, Type A.
 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 4. Water-Reducing and Accelerating Admixture: ASTM C 494/C 494M, Type E.
 5. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 6. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 7. Plasticizing Admixture: ASTM C 1017/C 1017M, Type I.
 8. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
 9. Corrosion Inhibiting Admixture: ASTM C 1582/C 1582M.
- 4) STEEL CONNECTION MATERIALS
- A. Deformed-Steel Wire or Bar Anchors: ASTM A 496/A 496M or ASTM A 706/A 706M.
- 5) GROUT MATERIALS
- A. Pointing Grout: Packaged, polymer-modified, sanded grout complying with ANSI A118.7.
1. Polymer Type: Acrylic resin in dry, redispersible form, packaged with other dry ingredients.
 2. Colors: To match color used on walls, refer to Section 042000, "Unit Masonry". Product to be approved by Landscape Architect.
- 6) CONCRETE MIXTURES
- A. Prepare design mixtures for each type of precast concrete required.
1. Use a single design mixture for units with more than one major face or edge exposed.
 2. Where only one face of unit is exposed use either a single design mixture or separate mixtures for face and backup.
- B. Limit use of fly ash and ground granulated blast-furnace slag to 20 percent of portland cement by weight; limit metakaolin and silica fume to 10 percent of portland cement by weight.
- C. Design mixtures may be prepared by a qualified independent testing agency or by qualified precast plant personnel at architectural precast concrete fabricator's option.
- D. Limit water-soluble chloride ions to maximum percentage by weight of cement permitted by ACI 318 or PCI MNL 117 when tested according to ASTM C 1218/C 1218M.

- E. Normal-Weight Concrete Mixtures: Proportion full-depth mixture by either laboratory trial batch or field test data methods according to ACI 211.1, with materials to be used on Project, to provide normal-weight concrete with the following properties:
 - 1. Compressive Strength (28 Days): 5000 psi minimum.
 - 2. Maximum Water-Cementitious Materials Ratio: 0.45.
 - F. Water Absorption: 6 percent by weight or 14 percent by volume, tested according to ASTM C 642, except for boiling requirement.
 - G. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having an air content complying with PCI MNL 117.
 - H. When included in design mixtures, add other admixtures to concrete mixtures according to manufacturer's written instructions.
- 7) MOLD FABRICATION
- A. Molds: Accurately construct molds, mortar tight, of sufficient strength to withstand pressures due to concrete-placement operations and temperature changes and for prestressing and detensioning operations. Coat contact surfaces of molds with release agent before reinforcement is placed. Avoid contamination of reinforcement and prestressing tendons by release agent.
 - 1. Place form liners accurately to provide finished surface texture indicated. Provide solid backing and supports to maintain stability of liners during concrete placement. Coat form liner with form-release agent.
 - B. Maintain molds to provide completed architectural precast concrete units of shapes, lines, and dimensions indicated, within fabrication tolerances specified.
 - 1. Form joints are not permitted on faces exposed to view in the finished work.
 - 2. Edge and Corner Treatment: Uniformly radiused.
- 8) FABRICATION
- A. Cast-in reglets, slots, holes, and other accessories in architectural precast concrete units as indicated on the Contract Drawings.
 - B. Reinforcement: Comply with recommendations in PCI MNL 117 for fabricating, placing, and supporting reinforcement.
 - 1. Clean reinforcement of loose rust and mill scale, earth, and other materials that reduce or destroy the bond with concrete. When damage to epoxy-coated reinforcing exceeds limits specified in ASTM A 775/A 775M, repair with patching material compatible with coating material and epoxy coat bar ends after cutting.

2. Accurately position, support, and secure reinforcement against displacement during concrete-placement and consolidation operations. Completely conceal support devices to prevent exposure on finished surfaces.
 3. Place reinforcing steel and prestressing strands to maintain at least 3/4-inch minimum concrete cover. Increase cover requirements for reinforcing steel to 1-1/2 inches when units are exposed to corrosive environment or severe exposure conditions. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position while placing concrete. Direct wire tie ends away from finished, exposed concrete surfaces.
 4. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh spacing and wire tie laps, where required by design. Offset laps of adjoining widths to prevent continuous laps in either direction.
- C. Reinforce architectural precast concrete units to resist handling, transportation, and erection stresses and specified in-place loads.
- D. Comply with requirements in PCI MNL 117 and requirements in this Section for measuring, mixing, transporting, and placing concrete. After concrete batching, no additional water may be added.
- E. Place face mixture to a minimum thickness after consolidation of the greater of 1 inch or 1.5 times the maximum aggregate size, but not less than the minimum reinforcing cover specified.
- F. Place concrete in a continuous operation to prevent cold joints or planes of weakness from forming in precast concrete units.
1. Place backup concrete mixture to ensure bond with face-mixture concrete.
- G. Thoroughly consolidate placed concrete by internal and external vibration without dislocating or damaging reinforcement and built-in items, and minimize pour lines, honeycombing, or entrapped air voids on surfaces. Use equipment and procedures complying with PCI MNL 117.
1. Place self-consolidating concrete without vibration according to PCI TR-6, "Interim Guidelines for the Use of Self-Consolidating Concrete in Precast/Prestressed Concrete Institute Member Plants." Ensure adequate bond between face and backup concrete, if used.
- H. Comply with PCI MNL 117 for hot- and cold-weather concrete placement.
- I. Identify pickup points of architectural precast concrete units and orientation in structure with permanent markings, complying with markings indicated on Shop Drawings. Imprint or permanently mark casting date on each architectural precast concrete unit on a surface that does not show in finished structure.

- J. Cure concrete, according to requirements in PCI MNL 117, by moisture retention without heat or by accelerated heat curing using low-pressure live steam or radiant heat and moisture. Cure units until compressive strength is high enough to ensure that stripping does not have an effect on performance or appearance of final product.
- K. Discard and replace architectural precast concrete units that do not comply with requirements, including structural, manufacturing tolerance, and appearance, unless repairs meet requirements in PCI MNL 117 and Architect's approval.

9) FABRICATION TOLERANCES

- A. Fabricate architectural precast concrete units to shapes, lines, and dimensions indicated so each finished unit complies with PCI MNL 117 product tolerances as well as position tolerances for cast-in items.

10) FINISHES

- A. Exposed faces shall be free of joint marks, grain, and other obvious defects. Corners, including false joints shall be uniform, straight, and sharp. Finish exposed-face surfaces of architectural precast concrete units to match approved sample panels and as follows:
 - 1. As-Cast Surface Finish: Provide surfaces to match precast concrete caps on existing walls at intersection of Mill St. and Main St. .
- B. Finish exposed top surfaces of architectural precast concrete units to match face-surface finish.
- C. Finish unexposed surfaces of architectural precast concrete units with as cast finish.

11) SOURCE QUALITY CONTROL

- A. Quality-Control Testing: Test and inspect precast concrete according to PCI MNL 117 requirements. If using self-consolidating concrete, also test and inspect according to PCI TR-6, ASTM C 1610/C 1610M, ASTM C 1611/C 1611M, ASTM C 1621/C 1621M, and ASTM C 1712.
- B. Strength of precast concrete units is considered deficient if units fail to comply with ACI 318 requirements for concrete strength.
- C. Testing: If there is evidence that strength of precast concrete units may be deficient or may not comply with ACI 318 requirements, precaster will employ an independent testing agency to obtain, prepare, and test cores drilled from hardened concrete to determine compressive strength according to ASTM C 42/C 42M and ACI 318.

1. A minimum of three representative cores shall be taken from units of suspect strength, from locations directed by Landscape Architect.
 2. Test cores in an air-dry condition.
 3. Strength of concrete for each series of three cores is considered satisfactory if average compressive strength is equal to at least 85 percent of 28-day design compressive strength and no single core is less than 75 percent of 28-day design compressive strength.
 4. Report test results in writing on same day that tests are performed, with copies to Architect, Contractor, and precast concrete fabricator. Test reports include the following:
 - a. Project identification name and number.
 - b. Date when tests were performed.
 - c. Name of precast concrete fabricator.
 - d. Name of concrete testing agency.
 - e. Identification letter, name, and type of precast concrete unit(s) represented by core tests; design compressive strength; type of break; compressive strength at breaks, corrected for length-diameter ratio; and direction of applied load to core in relation to horizontal plane of concrete as placed.
- D. Patching: If core test results are satisfactory and precast concrete units comply with requirements, clean and dampen core holes and solidly fill with precast concrete mixture that has no coarse aggregate, and finish to match adjacent precast concrete surfaces.
- E. Defective Units: Discard and replace precast architectural concrete units that do not comply with acceptability requirements in PCI MNL 117, including concrete strength, manufacturing tolerances, and color and texture range. Chipped, spalled, or cracked units may be repaired, subject to Architect's approval. Architect reserves the right to reject precast units that do not match approved samples, sample panels, and mockups. Replace unacceptable units with precast concrete units that comply with requirements.

PART 9 - EXECUTION

1) EXAMINATION

- A. Examine supporting structural frame or foundation and conditions for compliance with requirements for installation tolerances, bearing surface tolerances, and other conditions affecting performance of the Work.
- B. Do not install precast concrete units until supporting cast-in-place concrete has attained minimum allowable design compressive strength and supporting steel or other structure is structurally ready to receive loads from precast concrete units.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

2) INSTALLATION

- A. Install clips, hangers, bearing pads, and other accessories required for connecting architectural precast concrete units to supporting members and backup materials.
- B. Erect architectural precast concrete level, plumb, and square within specified allowable tolerances. Provide temporary supports and bracing as required to maintain position, stability, and alignment of units until permanent connections are completed.
 - 1. Install temporary steel or plastic spacing shims as precast concrete units are being erected. Tack weld steel shims to each other to prevent shims from separating.
 - 2. Maintain horizontal and vertical joint alignment and uniform joint width as erection progresses.
 - 3. Remove projecting lifting devices and grout fill voids within recessed lifting devices flush with surface of adjacent precast surfaces when recess is exposed.
 - 4. Unless otherwise indicated, maintain uniform joint widths of 3/4 inch.
- C. Connect architectural precast concrete units in position by bolting, welding, grouting, or as otherwise indicated on Shop Drawings. Remove temporary shims, wedges, and spacers as soon as practical after connecting and grouting are completed.
- D. Grouting or Dry-Packing Connections and Joints: Grout connections where required or indicated. Retain flowable grout in place until hard enough to support itself. Alternatively, pack spaces with stiff dry-pack grout material, tamping until voids are completely filled. Place grout and finish smooth, level, and plumb with adjacent concrete surfaces. Promptly remove grout material from exposed surfaces before it affects finishes or hardens. Keep grouted joints damp for not less than 24 hours after initial set.

3) FIELD QUALITY CONTROL

- A. Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.
- B. Visually inspect field welds and test according to ASTM E 165 or to ASTM E 709 and ASTM E 1444. High-strength bolted connections are subject to inspections.
- C. Testing agency will report test results promptly and in writing to Contractor and Landscape Architect.
- D. Repair or remove and replace work where tests and inspections indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, shall be performed to determine compliance of replaced or additional work with specified requirements.

4) REPAIRS

- A. Repair architectural precast concrete units if permitted by Landscape Architect. Landscape Architect reserves the right to reject repaired units that do not comply with requirements.
- B. Mix patching materials and repair units so cured patches blend with color, texture, and uniformity of adjacent exposed surfaces and show no apparent line of demarcation between original and repaired work, when viewed in typical daylight illumination from a distance of 20 feet.
- C. Prepare and repair damaged galvanized coatings with galvanizing repair paint according to ASTM A 780/A 780M.
- D. Wire brush, clean, and paint damaged prime-painted components with same type of shop primer.
- E. Remove and replace damaged architectural precast concrete units when repairs do not comply with requirements.

5) CLEANING

- A. Clean surfaces of precast concrete units exposed to view.
- B. Clean mortar, plaster, fireproofing, weld slag, and other deleterious material from concrete surfaces and adjacent materials immediately.
- C. Clean exposed surfaces of precast concrete units after erection and completion of joint treatment to remove weld marks, other markings, dirt, and stains.
 - 1. Perform cleaning procedures, if necessary, according to precast concrete fabricator's recommendations. Protect other work from staining or damage due to cleaning operations.
 - 2. Do not use cleaning materials or processes that could change the appearance of exposed concrete finishes or damage adjacent materials.

END OF SECTION 034500

UNIT MASONRY**SECTION 042000**

PART 10 - GENERAL

1) SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Full bricks
3. Face bricks
4. Mortar and grout
5. Ties and anchors
6. Masonry-joint reinforcement

2) DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

3) ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: Showing the full range of colors and textures available for exposed bricks, CMUs and accessories embedded in masonry.

4) INFORMATIONAL SUBMITTALS

- A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Receipt of list does not constitute approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
 - B. Qualification Data: For testing agency.
 - C. Material Certificates: For each type and size of the following:
 - 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 specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
 2. Include test reports, according to ASTM C 1019, for grout mixes required 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 determined according to TMS 602/ACI 530.1/ASCE 6.
- 5) QUALITY ASSURANCE
- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.
 - B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 1. Build mockups for the wall or portion of wall no less than 10 inch wide x 18 inch height.
 - a. Include typical base and specified cap.
 - b. Include a sealant-filled joint at least 16 inches long in mockup.
 - c. Include typical finished grades at both sides of wall. Include typical end construction at one end of mockup.
 - d. Include example of all accent band types to full width within the field.
 - e. For walls with additional metal or wood accent, include no less than 36 of metal and wood ornamentation as a component of one overall mock up or two 36 inch x 36 inch mock ups for a total of 60 inches of overall length represented onsite for Architect and Owner approval.

2. Protect accepted mockups from the elements with weather-resistant membrane.
 3. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
 - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
 - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- 6) 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. Store preblended, dry mortar mix in delivery containers on elevated platforms 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.
- 7) FIELD 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.
 1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.
 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe, and hold cover in place.

- 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.

PART 11 - PRODUCTS

1) MASONRY UNITS

- A. Concrete Masonry Units: ASTM C 90
 - 1. Size: 8"x8"x16
 - 2. Unit Compressive Strength: 1900-psi- minimum, average net-area compressive strength.
 - 3. Weight Classification: Normal weight.
 - 4. Type: I, moisture-controlled units.
- B. Face Brick Type 1
 - 1. Thickness: 5/8 inch
 - 2. Face Size: To match brick size on existing walls
 - a. Thin Brick corner (90 degree): 2 5/8 inch height x 7-5/8 inch long x 2 5/8 inch return
 - b. Thin Brick: 2 5/8 inch height x 7-5/8 inch long
 - 3. Color: To match brick color on existing walls

2) MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II,
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Mortar Cement: ASTM C 1329.
- D. Masonry Cement: ASTM C 91
- E. Pigmented Mortar: Colored cement or cement-lime formulation, color as stated above.

- F. Aggregate for Mortar: ASTM C 144; use aggregate graded with 100 percent passing the No. 16 sieve.
- G. Colored-Mortar Aggregates: Natural-colored sand or ground marble, granite, to match grout color.
- H. Aggregate for Grout: ASTM C 404.
- I. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.
- J. Brick Cap Adhesive: Product supplied or recommended by segmental retaining wall unit manufacturer for adhering cap units to units below.

3) REINFORCING

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M; ASTM A 616/A 616M, including Supplement 1; or ASTM A 617/A 617M, Grade 60, reference structural specifications for CMU columns and segmental retaining wall, single-wythe wall manufacturer's recommendations.
- B. Masonry Joint Reinforcement: ASTM A 951; mill galvanized, carbon-steel wire for interior walls and hot-dip galvanized, carbon-steel wire for exterior walls.
 - 1. Wire Size for Side Rods: W2.8 or 0.188-inch diameter.
 - 2. Wire Size for Cross Rods: W2.8 or 0.188-inch diameter.
 - 3. Single-Wythe Masonry Construction: Install per manufacturer's instructions or utilize horizontal ladder wire at 1 ¼" wide, unexposed for first 18" of panel. After 18", steel reinforced every 3rd course.
 - 4. Multiwythe Masonry: Use ladder type with perpendicular cross rods spaced not more than 16 inches o.c. and 1 side rod for each face shell of hollow masonry units more than 4 inches in width, plus 1 side rod for each wythe of masonry 4 inches or less in width, for walls or columns under 30". Refer to structural specifications for taller walls and columns.

4) TIES AND ANCHORS

- A. Materials, General: As follows, unless otherwise indicated:
 - 1. Galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating for exterior walls.
 - 2. Galvanized Steel Sheet: ASTM A 366/A 366M cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A 153, at exterior walls;
- B. Bent Wire Ties: Rectangular units with closed ends and not less than 4 inches wide, made from 3/16-inch- diameter, galvanized steel wire.

- C. Anchors for Connecting to Concrete: Provide two-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to wall.
1. Anchor Section: Dovetail anchor section formed from 0.0528-inch- thick, galvanized steel sheet.
 2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.1875-inch- diameter, galvanized steel wire.
- D. Adjustable Masonry-Veneer Anchors: Provide 2-piece assemblies that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to wall, for attachment over sheathing to wood or metal studs, and that are capable of withstanding a 100-lbf load in both tension and compression without deforming or developing play in excess of
1. Screw-Attached, Masonry-Veneer Anchors: Units with triangular wire tie and rib stiffened, sheet metal anchor section with screw holes top and bottom and with raised rib-stiffened strap stamped into center to provide a slot for connection of wire tie.
- 5) MASONRY CLEANERS
- A. Job-Mixed Detergent Solution: Solution of 1/2-cup dry measure tetrasodium polyphosphate and 1/2-cup dry measure laundry detergent dissolved in 1 gal. of water.
- B. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
1. Products:
 - a. Cleaners for Red and Light-Colored Brick Not Subject to Metallic Staining with Mortar Not Subject to Bleaching:
 - 1) Diedrich Technologies, Inc.; 202 New Masonry Detergent.
 - 2) ProSoCo, Inc.; Sure Klean No. 600 Detergent.
 - b. Cleaners for Red and Dark-Colored Brick Not Subject to Metallic Staining:
 - 1) Diedrich Technologies, Inc.; 200 Lime Solv.
 - 2) ProSoCo., Inc.; Sure Klean No. 101 Lime Solvent.
 - c. Cleaners for Brick Subject to Metallic Staining:
 - 1) Diedrich Technologies, Inc.; 202V Vana-Stop.
ProSoCo, Inc.; Sure Klean Vana Trol.
- 6) SOURCE QUALITY CONTROL
- A. Owner will engage a qualified independent testing agency to perform source quality control testing indicated below. Payment for these services will be made by Owner.
- B. Brick Tests: For each type and grade of brick indicated, units will be tested according to ASTM C 67.

- C. Concrete Masonry Unit Tests: For each type of concrete masonry unit indicated, units will be tested according to ASTM C 140.

PART 12 - EXECUTION

1) EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 - 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
 - 2. Verify that foundations are within tolerances specified.
 - 3. Verify that reinforcing dowels are properly placed.
 - 4. Verify that substrates are free of substances that impair mortar bond.
- 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.

2) INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated and install per manufacturer's recommendation.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.
- D. 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.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures. Mix units from several pallets or cubes as they are placed.
- F. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested according to ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3) TOLERANCES

A. Dimensions and Locations of Elements:

1. For dimensions in cross section or elevation, do not vary by more than plus 1/2 inch or minus 1/4 inch.
2. For location of elements in plan, do not vary from that indicated by more than plus or minus 1/2 inch.
3. For location of elements in elevation, do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch 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, 1/4 inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces, do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch 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, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch 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, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

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 Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by stepping 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.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. 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.

5) MORTAR BEDDING AND JOINTING

- A. Lay hollow brick and CMUs as follows:
 - 1. Bed face shells in mortar and make head joints of depth equal to bed joints.
 - 2. Bed webs in mortar in all courses of piers, columns, and pilasters.
 - 3. Bed webs in mortar in grouted masonry, including starting course on footings.
 - 4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.
 - 5. Fully bed units and fill cells with mortar at anchors and ties as needed to fully embed anchors and ties in mortar.
- B. Lay solid masonry units and hollow brick with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

- C. Lay structural clay tile as follows:
1. Lay vertical-cell units with full head joints unless otherwise indicated. Provide bed joints with full mortar coverage on face shells and webs.
 2. Lay horizontal-cell units with full bed joints unless otherwise indicated. Keep drainage channels, if any, free of mortar. Form head joints with sufficient mortar so excess will be squeezed out as units are placed in position. Butter both sides of units to be placed, or butter one side of unit already in place and one side of unit to be placed.
 3. Maintain joint thicknesses indicated except for minor variations required to maintain bond alignment. If not indicated, lay walls with 1/4- to 3/8-inch- (6- to 10-mm-) thick joints.
- D. Set firebox brick in full bed of refractory mortar with full head joints. Form joints by buttering both surfaces of adjoining brick and sliding it into place. Make joints just wide enough to accommodate variations in size of brick, approximately 1/8 inch (3 mm). Tool joints smooth on surfaces exposed to fire or smoke.
- E. Install clay flue liners to comply with ASTM C 1283. Install flue liners ahead of surrounding masonry. Set clay flue liners in full bed of refractory mortar 1/16 to 1/8 inch thick. Strike joints flush on inside of flue to provide smooth surface. Maintain expansion space between flue liner and surrounding masonry except where surrounding masonry is required to provide lateral support for flue liners.
- F. Set cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
 2. Allow cleaned surfaces to dry before setting.
 3. Wet joint surfaces thoroughly before applying mortar.
 4. Rake out mortar joints for pointing with sealant.
- G. Rake out mortar joints at glazed brick to a uniform depth of 1/4 inch and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.
- H. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
1. For glazed masonry units, use a nonmetallic jointer 3/4 inch or more in width.
- I. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.
- J. Cut joints flush where indicated to receive waterproofing unless otherwise indicated.

6) CAVITY WALLS

- A. Keep cavities clean of mortar droppings and other materials during construction.
 - 1. Use wood strips temporarily placed in cavity to collect mortar droppings. As work progresses, remove strips, clean off mortar droppings, and replace in cavity.

7) ANCHORED MASONRY VENEERS

- A. Anchor masonry to structural members where masonry abuts or faces structural members to comply with the following:
 - 1. Provide an open space not less than 1 inch in width between masonry and structural member, unless otherwise indicated.
 - 2. Anchor masonry to structural members
- B. Anchor masonry veneers to concrete and masonry backup with masonry-veneer anchors to comply with the following requirements:
 - 1. Fasten each anchor section to concrete and masonry backup with two metal fasteners of type indicated.
 - 2. Embed tie sections in masonry joints. Provide not less than 2 inches of air space between back of masonry veneer and face of sheathing.
 - 3. Space anchors as indicated, but not more than 16 inches o.c. vertically and 24 inches o.c. horizontally with not less than 1 anchor for each 2.67 sq. ft. of wall area. Install additional anchors within 12 inches of openings and at intervals, not exceeding 36 inches, around perimeter.

8) MASONRY-JOINT REINFORCEMENT

- A. Temporary Formwork and Shores: Construct formwork and shores to support reinforced masonry elements during construction.
 - 1. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary 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 sufficient 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.

9) ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:

1. Provide an open space not less than 1/2 wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

10) CLEANING

- A. Clean unit masonry by dry brushing to remove mortar fins and smears before tooling joints, as work progresses.
- B. After mortar is thoroughly set and cured, clean exposed masonry as follows:
 1. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes.
 2. Protect adjacent surfaces from contact with cleaner.
 3. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing the surfaces thoroughly with clear water.
 4. Clean brick by the bucket-and-brush hand-cleaning method described in BIA Technical Notes No. 20, using job-mixed detergent solution.
 5. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
 6. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain on exposed surfaces.

11) MASONRY WASTE DISPOSAL

- A. Masonry Waste Disposal: Dispose of clean masonry waste, including broken masonry units, waste mortar, and excess or soil-contaminated sand, by crushing and mixing with fill material as fill is placed.
 1. Do not dispose of masonry waste as fill within 18 inches of finished grade. 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 042000

METAL FABRICATIONS**SECTION 05500**

PART 13 - GENERAL

- 1) RELATED DOCUMENTS Drawings and general provisions of the Contract.
- 2) SUMMARY
 - A. Section Includes:
 1. Bolts, anchors, nuts, sleeves, concrete anchors, scheduled items, and other miscellaneous metal items not specifically included under other sections of these specifications.
 - B. Related Requirements:
 1. Section 033000 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
 2. Section 042000 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
 3. Section 055213 "Pipe and Tube Railings
 4. Section 051200 "Structural Steel Framing."
- 3) REFERENCES
 - A. ASTM A 36 – Structural Steel
 - B. ASTM 53 – Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - C. ASTM A 123 - Zinc Coating (Hot-Dip Galvanized) on Iron and Steel Products.
 - D. ASTM A 153 – Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - E. ASTM A 276 - Stainless and Heat-Resisting Steel Bars and Shapes.
 - F. ASTM A 307 - Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength.

- G. ASTM A 500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.
 - H. ASTM A 501 - Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
 - I. ASTM F 593 - Stainless Steel Bolts, Hex Cap Screws, and Studs.
 - J. ASTM F 594 - Stainless Steel Nuts.
 - K. AWS A 2.0 - Standard Welding Symbols.
 - L. AWS D 1.1 - Structural Welding Code.
 - M. SSPC - Steel Structures Painting Council.
- 4) SUBMITTALS
- A. Shop Drawings: Indicate profiles, sizes, thickness, grade class, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
 - B. Indicate welded connections using standard AWS A 2.0 welding symbols. Indicate net weld lengths.
 - C. Submit manufacturer's technical literature and test reports showing certified capacities for concrete anchors.
 - D. When foreign manufactured material is proposed for use, test material for conformance to ASTM Standards by a certified independent testing laboratory located in the United States. Certification from any other source outside the United States is unacceptable. Furnish copies of test reports to Project Manager for review. Do not begin fabrication until material has been approved. No additional payment will be made for this testing.
- 5) INFORMATIONAL SUBMITTALS
- A. Qualification Data: For professional engineer.
 - B. Welding certificates.
- 6) QUALITY ASSURANCE
- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

7) FIELD CONDITIONS

- A. Verify that field measurements are as indicated on Drawings.

PART 14 - PRODUCTS

1) METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Stainless Steel Sections: ASTM A 276, Type 316 for non-welded items and Type 316L for welded items.
- C. Steel Tubing: ASTM A 500 or ASTM A 501, Grade B.
- D. Pipe: ASTM A 53, Grade B Schedule 40.
- E. Welding Materials: AWS D 1.1; type required for materials being welded.
- F. Shop and Touch-Up Primer: Same manufacturer as protective coating; compatible with protective coating; applied in accordance with manufacturer's recommendation.

2) FASTENERS

- A. Bolts, Nuts, and Washers: ASTM A 307 galvanized to ASTM A 153 for galvanized components. Provide anchor bolts for all equipment and machinery when anchor bolts are not furnished by manufacturer. Conform anchor size, length, projection, etc., to requirements of equipment and machinery manufacturer. Provide templates to accurately position anchor bolts in forms.
- B. Stainless Steel Bolts and Nuts: Bolts in accordance with ASTM F 593, Type 316; nuts in accordance with ASTM F 594, Type 316; UNC coarse threads.
- C. Concrete Anchors: Concrete anchors are inserted into holes drilled in hardened concrete. Use one of the following types:
 - 1. Adhesive Anchors: For concrete anchors which are submerged, in splash zones, in enclosed spaces over liquids, or anchoring vibrating equipment, use epoxy adhesive anchors. Adhesive anchors may be used at all locations where concrete anchors are required. Epoxy systems shall be Sika/FI System with Sikadur Injection Gel Epoxy, Master Builders Concrete Epoxy Cartridge Dispensing System and Concrete Paste LPL, or equal. Threaded rods shall be ASTM F 593, Type 316 studs. Where adhesive anchors, or connected metal, are exposed to direct sunlight, the anchors shall be certified to maintain at least 90 percent of their rated strength (tested at 73 F) when tested at 160 F.

2. Expansion Anchors: Where concrete anchors are indicated and adhesive anchors are not required, wedge type anchors made with ASTM A 276, Type 316 Stainless Steel shall be used. Anchors shall be KWIK Bolt II By Hilti, Inc., or equal.

3) FABRICATION, GENERAL

- A. Fit and shop-assemble in largest practical sections for delivery to site.
- B. Fabricate items with joints tightly fitted and secured. Weld all shop connections except where welding is not practical, or unless otherwise shown on Drawings. Where screw bolts cannot be avoided, conceal fasteners where possible or countersink heads, screw up tight and nick threads to prevent loosening.
- C. Welding shall conform to requirements of AWS D1.1, Structural Welding Code – Steel. Perform welding not governed by above in accordance with best modern practice for strength and durability.
- D. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- E. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- F. Form exposed work with accurate angles and surfaces and straight edges.
- G. Weld corners and seams continuously to comply 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. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- I. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- J. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

- K. Provide components required for anchorage of fabrications; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support loads. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
 - L. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches (3.2 by 38 mm), with a minimum 4-inch (150-mm) embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 12 inches o.c., unless otherwise indicated.
- 4) FINISHES, GENERAL
- A. Finish metal fabrications after assembly.
 - B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.
 - C. Handrails and Guardrails: 055213 "Pipe and Tube Railings"

PART 15 - EXECUTION

- 1) INSTALLATION, GENERAL
- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
 - B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
 - C. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
 - D. Field Welding: Comply with the following requirements:
 - 1. Field weld components indicated on shop drawings.
 - 2. Perform field welding in accordance with AWS D 1.1.
 - 3. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 4. Obtain fusion without undercut or overlap.

5. Remove welding flux immediately.
 6. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- E. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
 - F. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
 - G. Obtain Landscape Architect's approval prior to cutting or making adjustments in the field.
 - H. After erection, prime welds, abrasions, and surfaces not shop primed except surfaces to be in contact with concrete.
- 2) ADJUSTING AND CLEANING
- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
 - B. Thoroughly clean field welds, abrasions, and damaged or defective areas of galvanized surfaces to remove all loose, cracked or bruised splatter coating. After surface is prepared, for galvanized surfaces apply two coats of galvanizing repair coating, as approved by Landscape Architect. Repair other coated surfaces in accordance with manufacturer's recommendations, unless otherwise specified.

END OF SECTION 055000

PIPE AND TUBE RAILS**SECTION 055213**

PART 16 - GENERAL

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.

2) SUMMARY

- A. Section Includes:
 - 1. Steel [**pipe**] [**and**] [**tube**] railings.
- B. Related Requirements:
 - 1. Section 055000 "Metal Fabrications"

3) COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for railings. 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.
- C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

4) ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of mechanically connected railings.
 - 2. Railing brackets.

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3. Grout, anchoring cement, and paint products.
 - B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - C. Samples: For each type of exposed finish required.
 1. Contractor to install one railing to serve as mockup to be approved by Landscape Architect.
 2. Assembled Sample of railing system, made from full-size components, including top rail, post, handrail, and infill. Sample need not be full height.
 - a. Show method of **connecting and finishing** members at intersections.
- 5) INFORMATIONAL SUBMITTALS
- A. Qualification Data: For testing agency.
 - B. Welding certificates.
 - C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.
 - D. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.
 - E. Evaluation Reports: For post-installed anchors, from ICC-ES.
- 6) QUALITY ASSURANCE
- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- 7) DELIVERY, STORAGE, AND HANDLING
- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- 8) FIELD CONDITIONS
- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 17 - PRODUCTS

1) MANUFACTURERS

- A. Source Limitations: Obtain each type of railing from single source from single manufacturer.

2) PERFORMANCE REQUIREMENTS

- A. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:

1. Handrails and Top Rails of Guards:

- a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
- b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
- c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

- a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
- b. Infill load and other loads need not be assumed to act concurrently.

- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: [**120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.**]

3) METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.

- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

1. Provide type of bracket with **predrilled hole for exposed bolt anchorage** and that provides 1-1/2-inch (38-mm) clearance from inside face of handrail to finished wall surface.

- 4) STEEL
- A. Tubing: **ASTM A 500 (cold formed) or ASTM A 513.**
 - B. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
 - 1. Refer to drawings for pipe dimensions and details
 - C. Plates, Shapes, and Bars: ASTM A 36/A 36M.
 - D. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.
- 5) FASTENERS
- A. General: Provide the following:
 - 1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 5 for zinc coating.
 - B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated.
 - C. Fasteners for Interconnecting Railing Components:
 - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
 - 2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable.
 - 3. Provide **tamper-resistant** flat-head machine screws for exposed fasteners unless otherwise indicated.
- 6) MISCELLANEOUS MATERIALS
- A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
 - B. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.
 - C. Epoxy Intermediate Coat: Complying with MPI #77 and compatible with primer and topcoat.

- D. Polyurethane Topcoat: Complying with MPI #72 and compatible with undercoat.
- E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- F. Anchoring Cement: Factory-packaged, nonshrink, nonstaining, hydraulic-controlled expansion cement formulation for mixing with water at Project site to create pourable anchoring, patching, and grouting compound.

7) FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage
- B. Shop assemble railings 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.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 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 flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Form Changes in Direction as Follows:

1. As detailed.
 - J. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
 - K. Close exposed ends of railing members with prefabricated end fittings.
 - L. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.
 - M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
 - N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
 - O. For railing posts set in concrete, provide steel sleeves not less than 6 inches (150 mm) long with inside dimensions not less than 1/2 inch (13 mm) greater than outside dimensions of post, with metal plate forming bottom closure.
- 8) STEEL AND IRON FINISHES
- A. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with **SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."** **SSPC-SP 3, "Power Tool Cleaning."** requirements indicated below:
 1. Exterior Railings: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 2. Other Railings: SSPC-SP 3, "Power Tool Cleaning."
 - B. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.
 - C. Shop-Painted Finish:
 1. Color: to match existing handrails.

PART 18 - EXECUTION

1) INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
 - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (6 mm in 3.5 m).
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

2) RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (150 mm) of post.

3) ANCHORING POSTS

- A. Form or core-drill holes not less than 6 inches (125 mm) deep and 3/4 inch (20 mm) larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with **nonsrink, nonmetallic groutoranchoring cement**, mixed and placed to comply with anchoring material manufacturer's written instructions.

1. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces. Retain paragraph below if applicable.
- 4) ADJUSTING AND CLEANING
- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.
 1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
- 5) PROTECTION
- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 055213

**EARTH MOVING
SECTION 312000**

PART 19 - GENERAL

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.

2) SUMMARY

- A. Work included in this section:

1. Excavating and filling for rough grading the Site.
2. Preparing subgrades for walks, pavements, turf and grasses and plants.
3. Finished Grading

- B. Related Requirements:

1. Section 311000 "Site Clearing" for site stripping, grubbing, stripping, topsoil, and removal of above- and below-grade obstructions.
2. Section 329200 "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.
3. Section 329300 "Plants" for finish grading in planting areas and tree and shrub pit excavation and planting.

3) DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

- B. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

- C. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

- D. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
 - E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
 - 1. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Landscape Architect, shall be without additional compensation.
 - F. Fill: Soil materials used to raise existing grades.
 - G. Subbase Course: Aggregate layer placed between the subgrade and subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
 - H. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
 - I. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.
- 4) ACTION SUBMITTALS
- A. Product Data: For each type of the following manufactured products required:
 - 1. Topsoil: Contractor to supply a small bag of soil samples to Landscape Architect for approval prior to delivery of material to site.
- 5) INFORMATIONAL SUBMITTALS
- A. Qualification Data: For qualified testing agency.
 - B. Material Test Reports: For each] soil material proposed for fill and/or topsoil as follows:
 - 1. Classification according to ASTM D 2487.
 - 2. Laboratory compaction curve according to [ASTM D 698] [ASTM D 1557].
- 6) QUALITY ASSURANCE
- A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

7) FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures are in place.
- C. Do not commence earth-moving operations until plant-protection measures specified in Section 015639 "Temporary Tree and Plant Protection" are in place.
- D. The following practices are prohibited within protection zones:
 - 1. Storage of construction materials, debris or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Erection of sheds or structures.
 - 4. Impoundment of water.
 - 5. Excavation or other digging unless otherwise indicated.
 - 6. Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.

PART 20 - EXECUTION

1) GENERAL

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth-moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.
- D. Finished grading shall be defined as placing and grading of additional soil (topsoil 2"-3" minimum) required bringing the grade to the required grades for lawns or planting areas. As well as to smooth out rough areas. Where practical and as directed, the use of heavy machinery is allowed unless otherwise noted (above retaining wall drainage is prohibited) and should be kept to a minimum.

2) PLACEMENT OF FINE GRADE MATERIALS

- A. Clear the subgrade of stones larger than 2 inches (2") in any dimension, and of concrete, wood, construction debris and other deleterious matter. Excavate to a depth of 12 inches (12") all areas that have become saturated with oil, gasoline or bituminous products and backfill with clean earth.
- B. Import topsoil directly to site of deposition or stockpile new topsoil on site in quantity needed to produce the required depth after spreading. Protect topsoil piles from erosion and oversaturation with tarpaulins and limit boards.
- C. Spread topsoil to a minimum settled depth of 2 to 3 inches and feather smoothly into finished grade at edges so as to blend with adjacent ground shapes. Do not spread oversaturated top soil.
- D. Exercise precautions to keep the topsoil friable and porous. Do not handle or work topsoil when it is excessively wet, or during a rainfall. Do not place topsoil on any subgrade that has not been loosened or tilled, or allowed for drainage. Loosen and till the full depth of the topsoil and re-till any areas that become unduly compacted by vehicular movement. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- E. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3) FINE GRADING

- A. The Contractor shall be responsible for minor adjustments to the finished subgrade if such treatment is required in the opinion of the landscape architect.
- B. Hand rakes the surface, removing all clods and undesirable material greater than one half inch (1/2") from ground surface. Fill all low spots with specified materials and cut irregularities to the acceptance of the landscape architect.
- C. An acceptable fine grade shall be free from depressions greater than 6 inches (6") over any given space of 25' except at grade transitions which shall be gradual and even.
- D. During the finished grading operations, all swales and additional swales that may be required to drain areas shall be finished. In general, all grade adjustments shall be made so there are no areas that will have standing water.
- E. To prevent excessive weed growth in the lawn areas, the contractor should be prepared to immediately install the lawn upon the completed and acceptable finished grade.

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4) EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

5) EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths and elevations or if not indicated on the drawings to ensure proper coverage, positive drainage and successful testing.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit.

6) STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

7) BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
1. Construction below finish grade including, where applicable, subdrainage, dampproofing and waterproofing
 2. Surveying locations of underground utilities for Record Documents.
 3. Testing and inspecting underground utilities.
 4. Removing concrete formwork.
 5. Removing trash and debris.
 6. Removing temporary shoring, bracing, and sheeting.
 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

8) SOIL FILL

- A. Place and compact fill material in layers to required elevations as follows:
1. Under grass and planted areas, use satisfactory soil material.
 2. Under walks and pavements, use satisfactory soil material.
 3. Under footings and foundations, use engineered fill.

- B. Place soil fill on subgrades free of mud, frost, snow, or ice.
- 9) SOIL MOISTURE CONTROL
- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 - 1. Do not place backfill or fill soil material on surfaces that are muddy or contain debris.
 - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.
- 10) COMPACTION OF SOIL BACKFILLS AND FILLS
- A. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of pavements.
 - B. Compact soil materials to avoid subsidence in future, scarify and recompact as necessary below pavements and turf.
- 11) GRADING
- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Grade to cross sections, lines and elevations indicated.
 - 1. Provide a smooth transition between adjacent existing grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
 - B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations.
- 12) PROTECTION
- A. Protecting Graded Areas: Protect newly graded areas from traffic and erosion. Keep free of trash and debris.
 - B. Do not drive trucks or equipment over finished areas.
 - C. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Landscape Architect; reshape and recompact.
- D. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact and reconstruct surfacing.
1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.
- 13) CLEAN UP AND REMOVAL
- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

CONCRETE PAVING**SECTION 321313**

PART 21 - GENERAL

1) RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract,

2) SUMMARY

- A. Section Includes Concrete Paving. **Including the Following:**

- 1. Walks.

- B. Related Requirements:

- 1. Section 033000 "Cast-in-Place Concrete"
- 2. Section 321373 "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within concrete paving and in joints between concrete paving and asphalt paving or adjacent construction.

3) REFERENCES

- A. ASTM – American Society for Testing and Materials
- B. ACI – American Concrete Institute, Manual of Concrete Practice.
- C. ASTM C31 – Standard Practice for Making and Curing Concrete Test Specimens in Field.
- D. ASTM C39 – Standard Test Methods for Compressive Strength of Cylindrical Concrete Specimens.
- E. ASTM C42 - Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
- F. ASTM C138 - Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.
- G. ASTM C143 - Standard Test Method for Slump of Hydraulic Cement Concrete.
- H. ASTM C172 - Standard Practice for Sampling Freshly Mixed Concrete.

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- I. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³).

4) DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

5) ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Joint Sealant: To Match Concrete.
 - 2. Expansion joint filler, sealant, backer rod and bond breaker
 - 3. Air-entrainment
 - 4. Curing Compound
- B. Samples for Initial Selection: For each type of product, ingredient, or admixture requiring color selection.
 - 1. Joint Sealant

6) INFORMATIONAL SUBMITTALS

- A. Material Certificates: For the following, from manufacturer:
 - 1. Cementitious materials.
 - 2. Steel reinforcement and reinforcement accessories.
 - 3. Concrete Mix Design: Ticket for each batch delivered showing the Mix identification, weight of cement, aggregate, water, aggregate sizes/proportion and air entrainment.
 - 4. Curing compounds.
 - 5. Applied finish materials.
 - 6. Joint fillers.

7) QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockups of full-thickness sections of concrete paving to demonstrate typical joints; surface finish, texture, and color; curing; and standard of workmanship.

2. Build mockup of concrete paving in the location and of the size indicated or, if not indicated, build mockups where directed by Landscape Architect and not less than 200 sq. ft.
 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Landscape Architect specifically approves such deviations in writing.
 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- B. Lines and Levels: established by a licensed Surveyor or registered Civil Engineer.
- C. Mix Standards: Conform to ACI Manual and the Portland Cement Association's "Design and Control of Concrete Mixes".
- 8) FIELD CONDITIONS
- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. Cold-Weather Concrete Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
1. When air temperature has fallen to or is expected to fall below 40 deg F (4.4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
 2. Do not use frozen materials or materials containing ice or snow.
 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.
- C. Existing Conditions: Coordinate with other trades prior to installation
- D. Hot-Weather Concrete Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F (32 deg C) at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 2. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 3. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

PART 22 - PRODUCTS

- 1) CONCRETE, GENERAL
 - A. ACI Publications: Comply with ACI 301 (ACI 301M) unless otherwise indicated.

- 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 Straight, unwarped wood or metal forms with nominal depth equal to or greater than proposed sidewalk thickness. The use of 2 inch by 4 inch lumber as forms will not be allowed.
 - C. Wavy surfaces and bulged walls or slab surfaces in finished work will be rejected.

- 3) STEEL REINFORCEMENT
 - A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420); deformed.
 - B. Epoxy-Coated, Joint Dowel Bars: ASTM A 775/A 775M; with ASTM A 615/A 615M, Grade 60 (Grade 420) plain-steel bars.
 - C. Tie Bars: ASTM A 615/A 615M, Grade 60; deformed.
 - D. Hook Bolts: ASTM A 307, Grade A, internally and externally threaded. Design hook-bolt joint assembly to hold coupling against paving form and in position during concreting operations, and to permit removal without damage to concrete or hook bolt.
 - E. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified.

- 4) CONCRETE MATERIALS
 - A. Cementitious Materials: Use the following cementitious materials, of same type, brand, and source throughout Project:
 1. Portland Cement: ASTM C 150/C 150M, portland cement **Type I, Type II.**
 - B. Sand Bed: Conform to material requirements for bank run sand. Coarse Aggregate:

1. Description: ASTM C33, hard, durable, uncoated, washed, graded, cleaned and screened crushed rock or gravel aggregate for regular weight concrete. Colors to contain dark tans and grays. Do not use crusher-run stone or bank-run gravel.
2. Grading: Do not use aggregate which as a maximum size exceeding 1/5 of narrowest dimension between sides of forms of member for which concrete is to be used, nor larger than 3/4 of the minimum clear spacing between reinforcing bars. Do not use coarse aggregate which exceeds 3/4 in. for paving.

C. Fine Aggregate:

1. Description: ASTM C33, clean, hard and durable sand. Do not use sand coated with injurious amounts of silt, loam, clay or other deleterious matter.
2. Grading Requirements:

Percent Passing	Sieve Size
45-70	#16
15-30	#50
3-8	#100

- D. Water: Clean, potable concrete mixing water free from injurious amounts of salts, oils, acids, alkalis, organic materials or other deleterious matter. As available from Owner.
- E. Air-Entraining Admixture: ASTM C 260

5) CURING MATERIALS

- A. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- B. Water: Potable.
- C. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

6) RELATED MATERIALS

- A. Expansion Joint Materials visible in the paving area:
 1. Premolded Joint Filler: ASTM D1751, non-extruding and bituminous type resilient filler, compatible with sealant and having a "guide strip" removable depth gauge.
 2. Joint Sealant: ASTM C290, non-slag sealant "Dynatred" by Pecora Corporation, (214) 278-8158 or "Sonolastic Sealant Two-Part" by Sonneborn, (612) 835-3434. Color: show in mockup; to be approved by Landscape Architect.

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3. Bond Breaker: Pressure-sensitive tape as recommended by sealant manufacturer to suit application.
4. water added.

PART 23 - EXECUTION

1) EXAMINATION

- A. Verification of Conditions: Verify that subgrade preparation for concrete paving has been completed including base course prior to commencement of work.
- B. Surface Drainage: Report in writing conflicts discovered on site or prior work done by others which would prevent positive drainage. Do not permit finished paving surfaces to vary more than 1/4 in. measured with a 10 ft. metal straightedge, except at grade changes. Ponding, pocking, "birdbaths" or other surface irregularities are not permitted. Properly correct irregularities.

2) PREPARATION

- A. Remove loose material from compacted subbase surface immediately before placing concrete.
- B. Templates: Use templates for anchor plates, bolts, inserts and other items embedded in concrete. Accurately secure so that they will not be displaced during placing of concrete.
- C. Excavate subgrade 6 inches beyond outside lines of sidewalk. Shape to line, grade and cross section. Compact subgrade to minimum of 90 percent maximum dry density at optimum to 3 percent above optimum moisture content, as determined by ASTM D 698.
- D. Immediately after subgrade is prepared, cover with compacted sand bed to depth as shown on drawings. Lay concrete when sand is moist but not saturated.
- E. Piping and Conduit: Do not embed piping, other than electrical conduit, in structural concrete. Locate conduit to maintain strength of structures at maximum. Verify size, length and location of electrical conduit.
- F. Aggregate Base Course: Compact base course to 95% compaction.

3) EDGE FORMS AND SCREED CONSTRUCTION

- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.

4) STEEL REINFORCEMENT INSTALLATION

- 1. Placement: Clean, bend and place reinforcements per ACI Manual of Concrete Practice. Do not extend bars through expansion joints.
- 2. Supports: Accurately and securely fasten or support reinforcements to prevent displacement before or during pouring. Hang footing bars from forms. Support wire mesh with suitable metal cradles. Use sufficient number of chairs to support reinforcement in manner to maintain reinforcement in center of slab vertically during placement.
- 3. Reinforcement Splices: Reinforcing bars - 24 bar diameter minimum.
- 4. Drill dowels into existing paving, sidewalk and driveways, secure with epoxy, and provide headers as required.

5) JOINTS

Locations: Provide control joints at locations and intervals shown on drawings. If no dimensions are shown on the drawings, provide control joints every 5' OC organized on drain location and weak points in concrete. Expansion joints should occur every 25', approximately every 200 sf or as indicated on drawings. If not dimensions are given, expansion joints should be provided at the edge of horizontal and vertical surfaces, change in material, or otherwise noted in drawings.

- 1. Placement: Place expansion joint materials in proper alignment with top edge of concrete. Securely hold in place to prevent movement.
- 2. Slip Sheet: Where expansion joints in concrete paving cannot be aligned with joints in structural slab, provide a continuous slip sheet between the offset joints.

6) CONCRETE PLACEMENT

- A. Notify Landscape Architect 48 hours prior to pouring.
- B. Place Concrete in conformance to the ACI Manual of Concrete Practice.

- 7) FINISHING
- A. General: Do not add water to concrete surfaces during finishing operations.
 - B. Brush Broom Finish
 - 1. On all on all concrete steps and walkways, provide a medium brush broom finish perpendicular to way traffic flows unless otherwise shown on drawings.
 - 2. On all concrete driveway ramps, provide a heavy broom finish perpendicular to way traffic flows.
 - C. Sandblasted Concrete Finish:
 - 1. During the greening process of concrete, sandblast to create a light textured finish on specified areas in the drawings. Refer to detail 10.1. Landscape Architect to provide photos of desired look prior to installation.
 - 2. Clean area and provide sealant after receiving approval from landscape Architect.
- 8) JOINTS:
- A. Sealing of Expansion Joints: After curing period, strip out depth gauge strips and carefully clean expansion joints. Fill with joint compound. Avoid spilling compound on paved surfaces or overflowing from joint.
- 9) NON-CONFORMING CONCRETE
- A. Remove and replace areas that fail compressive strength tests, with concrete of thickness shown on Drawings.
 - B. Replace nonconforming sections at no additional cost to the Owner.
- 10) DETECTABLE WARNING INSTALLATION
- A. Blockouts: Form blockouts in concrete for installation of detectable paving units specified in Drawings.
 - 1. Tolerance for Opening Size: Plus 1/8inch, no minus
 - B. Refer to section 321400 Unit Paving.
- 11) CONCRETE PROTECTION AND CURING
- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305.1 (ACI 305.1M) for hot-weather protection during curing. Protection:

1. Protect concrete against rapid drying and damage by rain.
 2. Keep concrete moist for at least 7 days. Protect with liquid curing compound or a covering that will not stain or discolor finished concrete surfaces. Obtain acceptance of proposed method prior to use by Landscape Architect, Civil Engineer and Owner
- B. Spraying: Spray concrete during curing period as frequently as drying conditions require.
- C. Curing: Cure concrete in accordance with the ACI Manual of Concrete Practice.
- D. Damage and Defacement: Protect concrete work against damage and defacement during subsequent construction operations until final acceptance.
- 12) PAVING TOLERANCES
- A. Comply with tolerances in ACI 117 (ACI 117M) and as follows:
1. Elevation: 3/4 inch (19 mm).
 2. Thickness: Plus 3/8 inch (10 mm), minus 1/4 inch (6 mm).
 3. Surface: Gap below 10-foot- (3-m-) long; unlevelled straightedge not to exceed 1/2 inch (13 mm).
 4. 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 Paving Edge: 1/4 inch per 12 inches (6 mm per 300 mm) of dowel.
 7. Joint Spacing: 3 inches (75 mm).
 8. Contraction Joint Depth: Plus 1/4 inch (6 mm), no minus.
 9. Joint Width: Plus 1/8 inch (3 mm), no minus.
- 13) FIELD QUALITY CONTROL
- A. Samples: Civil Engineer will select a qualified testing laboratory to take samples for testing during the course of the work as considered necessary.
- B. Rejected Materials: Remove off site immediately
- C. Cost of Removal and Retesting: Pay for full costs of removal of rejected concrete and its replacement with concrete of specified strength and retesting.
- 14) REPAIR AND PROTECTION
- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

- B. Drill test cores, where directed by Landscape Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.
- C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION 321313

CONCRETE PAVING JOINT SEALANTS**SECTION 321373**

SECTION 321373 - CONCRETE PAVING JOINT SEALANTS

PART 24 - GENERAL

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.

2) SUMMARY

- A. Section Includes:
 - 1. Cold-applied joint sealants.
 - 2. Joint-sealant backer materials.

3) ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples for Verification: Demonstrate sealant proposed as part of paving mockups.
- 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.

4) INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of joint sealant and accessory.

5) QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

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B. Product Testing: Test joint sealants using a qualified testing agency.

6) FIELD CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 25 - PRODUCTS

1) MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

2) COLD-APPLIED JOINT SEALANTS

A. Single-Component, Self-Leveling, Silicone Joint Sealant: ASTM D 5893/D 5893M, Type SL.

3) JOINT-SEALANT BACKER MATERIALS

A. Joint-Sealant Backer Materials: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.

B. 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.

4) PRIMERS

A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated.

PART 26 - EXECUTION

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.

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) 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.
- 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.
- 5) PAVING-JOINT-SEALANT SCHEDULE
- A. Joint-Sealant Application: Joints within concrete paving.
1. Joint Location:
 - a. Expansion and isolation joints in concrete paving.
 - b. Contraction joints in concrete paving.
 - c. Other joints as indicated.
 2. Joint Sealant: **Single-component, self-leveling, silicone joint sealant.**
 3. Joint-Sealant Color: Matching integral color concrete; matching standard/natural color concrete.

END OF SECTION 321373

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UNIT PAVING**SECTION 321400****PART 27 - GENERAL**

- 1) **RELATED DOCUMENTS** Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- 2) **SUMMARY**
 - A. **Section Includes:**
 1. Brick pavers set in aggregate and sand setting beds over concrete.
 2. Cast-in-place concrete edge restraints.
 - B. **Related Requirements:**
 1. Section 321313 "Concrete Paving" for concrete base under unit pavers and for cast-in-place concrete curbs and gutters serving as edge restraints for unit pavers.
- 3) **REFERENCES:**
 - A. Standard Specifications – Standard Specifications of the State of Texas, Department of Transportation, unless modified herein.
 - B. ANSI – American National Standards Institute, Inc.,
 - C. ASTM – American Society for Testing and Materials
- 4) **ACTION SUBMITTALS**
 - A. **Manufacturer's drawings and details:** Indicate perimeter conditions, relationships to adjoining materials and assemblies, expansion joints, concrete paver layout, patterns, color arrangement, installation and settling details.
 - B. **Product Data:** For the following:
 1. Brick Pavers
 2. Sealant and back-up material

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3. Expansion joint material
4. Grout and mortar mixes
5. Edge restraints
6. Decorative basalt gravel

C. Samples for Initial Selection: For each type of unit paver indicated and **the following:**

1. Joint materials involving color selection.
2. Exposed edge restraints involving color selection.

5) INFORMATIONAL SUBMITTALS

- A. Material Certificates: For unit pavers. Include statements of material properties indicating compliance with requirements, including compliance with standards. Provide for each type and size of unit.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for unit pavers, indicating compliance with requirements.

6) QUALITY ASSURANCE

- A. Qualifications: Refer to Bidders Qualification Statement
- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 1. One (1) laid up, grouted, 3 ft. x 3 ft. panel for each type of brick and pattern, including brick/stone detail at tree grate.
 2. Batching: Supply brick from one manufacturer and single batch.
 3. Lines and Levels: Employ a licensed surveyor or registered civil engineer to lay out and establish lines, levels, grades and positions.

7) DELIVERY, STORAGE, AND HANDLING

- A. Packing and Delivery: Deliver pavers to the job in the original grade-sealed cartons with legible labels and seals unbroken. No damage shall occur to produce during hauling, handling or unloading.
- B. Deliver concrete pavers to the site in steel banded, plastic banded or plastic wrapped packaging capable of transfer by forklift or clamp lift. Unload pavers at job site in such a manner that no damage occurs to the product.
- C. Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

- D. Store pavers on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. Cover bedding sand and joint sand with waterproof covering if needed to prevent exposure to rainfall or removal by wind. Secure the covering in place.
 - E. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
 - F. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
 - G. Store concrete paver cleaners and sealers per manufacturer's instructions.
 - H. Protection: Protect pavers from staining or chipping. Replace damaged or defective pavers at no cost to Owner.
- 8) FIELD CONDITIONS
- A. Cold-Weather Protection: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit paver work damaged by frost or freezing.
 - B. Establish and maintain required levels of grade elevations. Review installation procedures and coordinate paving work with other work affected by the paver work.
 - C. Protect partially completed pavers against weather damage or staining when work is not in progress.
 - D. Provide temporary barricades as required for protection of project work and public safety.
 - E. Protect adjacent work from damage, soiling and staining during paving operations.
 - F. Do not install sand or pavers during heavy rain.
 - G. Weather Limitations for Mortar and Grout:
 - 1. Cold-Weather Requirements: Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.
 - 2. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6. Provide artificial shade and windbreaks and use cooled materials as required. Do not apply mortar to substrates with temperatures of 100 deg F (38 deg C) and higher.
 - a. When ambient temperature exceeds 100 deg F (38 deg C), or when wind velocity exceeds 8 mph (13 km/h) and ambient temperature exceeds 90 deg F (32 deg C), set pavers within 1 minute of spreading setting-bed mortar.

9) SEQUENCING AND SCHEDULING

- A. Coordination: Coordinate with work in other sections to insure the following:
1. Sleeving and Conduits: Place all applicable sleeves and conduits prior to pouring concrete slab for concrete unit paving.
 2. Drainage Structures: Coordinate with Civil Engineer and storm drainage contractor to set all invert and rim elevations for drains to be located in concrete unit paving.
 3. Handrails, Bollards, Street Lights and Street Furniture: Set anchors or sleeves in place and pour footings prior to pouring of slab for brick paving.
 4. Pour concrete ramps prior to laying pavers. Concrete shall be cured prior to placement of pavers.

PART 28 - PRODUCTS

1) BRICK PAVERS

- A. Brick Pavers: Solid (uncored) pavers manufactured from extruded fireclay or shale and fired to produce a dense paver with an average absorption of less than 7% (in a 24-hour cold-water absorption test) and with an average compressive strength of not less than 5,400 PSI for an 5 bricks tested., complying with ASTM C902, SW grade, (Class SX, Type I).
1. Thickness: 2-1/4 inches.
 2. Face Size: 4 by 8 inches.
 3. Color: Courtyard Full Range
 4. Manufacturer: Pine Hall 336-779-6124.
- B. Brick Pavers: For ADA Compliance
1. Thickness: 2-1/4 inches.
 2. Face Size: 4 by 8 inches.
 3. Color: Antique Red
 4. Manufacturer: Pavestone (281) 391-7283.
- C. Paving brick, when tested in accordance with ASTM C-67, shall show no efflorescence. Submit manufacturer's certification of test results.

2) EQUIPMENT

- A. Cutting Tools: Use masonry saw for cutting concrete unit pavers to size. Do not score and break concrete unit pavers.

3) ACCESSORIES

- A. Pre-molded Joint Filler: ASTM D1751, non-extruding and bituminous type resilient filler, compatible with sealant and backer rod.
- B. Cork Joint Filler: Preformed strips complying with ASTM D 1752, Type II.

4) AGGREGATE SETTING-BED MATERIALS

- A. 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.
- B. Joint Sand: ASTM C33 or C144 sand polymeric sand for the joints or a joint stabilizer/sealer combination
- C. Herbicide: Commercial chemical for weed control, registered with the EPA. Provide in granular, liquid, or wettable powder form.

5) MORTAR SETTING-BED MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or Type II.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Sand: ASTM C 144.
- D. Water: Potable.
- E. Reinforcing Wire Fabric: Galvanized, welded wire fabric, 2 by 2 inches (50.8 by 50.8 mm) by 0.062 inch (1.57 mm) in diameter; comply with ASTM A 185/A 185M and ASTM A 82/A 82M except for minimum wire size.

6) MORTAR AND GROUT MIXES

- A. General: Comply with referenced standards and with manufacturers' written instructions for mix proportions, mixing equipment, mixer speeds, mixing containers, mixing times, and other procedures needed to produce setting-bed and joint materials of uniform quality and with optimal performance characteristics. Discard mortars and grout if they have reached their initial set before being used.
- B. Portland Cement Mortar Mix:
 - 1. Mix Ratio: 1:3 Portland cement/sand, 1/4 part hydrated lime by volume.
 - 2. Bed Thickness: 3/4 in. to 1-1/4 in.
 - 3. Add water to obtain stiff mix.
 - 4. Coloring: Standard commercial brand of chemically inert coloring material.

C. Portland Cement Grout Mix:

1. Joints Up to 1/2 in.: 1:2:1/4 Portland cement/sand/lime
2. Joints Over 1/2 in.: 1:3:1/4 Portland cement/sand/lime
3. Add water to obtain stiff mix.
4. Color: Sand
5. Refer to construction details for joint size

Use C and D on-structure or wet conditions:**D. Latex-Portland Cement Mortar Mix:**

1. Thick Bed: 1:3 Portland Cement/sand gauged with "Laticrete 3701". (Preferred)
2. Thin Bed: Portland Cement/sand gauged with "Laticrete 4237".

E. Latex-Portland Cement Grout Mix:

1. Mix: One part Portland Cement to one part sand gauged with "Laticrete 3701".
2. Color: Sand

PART 29 - EXECUTION**1) EXAMINATION**

- A. Examine surfaces indicated to receive unit paving, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance.
 1. Notify Landscape Architect of discovered conflicts and discrepancies on Drawings with conditions on the site which would prevent proper installation of paver work.
 2. Review site and verify that other trades have completed their work and that site is acceptable to receive work.
 3. Verify that subgrade preparation for pavers has been completed prior to commencement of work and that subgrade has been graded to allow for placement of aggregate base and concrete slab.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

2) PREPARATION

- A. Controls: Lay pavers work plumb and true to line and grade as indicated on the Drawings and in accordance with approved standards of concrete unit paving construction. Be responsible for proper drainage on paving surfaces.

- B. Cleaning: Clean brick before setting by thoroughly scrubbing with fiber brushes and follow with a thorough drenching with clean water. Use only mild cleaning compounds containing no caustic or harsh fillers or abrasives. Bricks with chips, cracks, voids, discoloration and other visible defects shall be rejected.
- C. Remove substances from concrete substrates that could impair mortar bond, including curing and sealing compounds, form oil, and laitance.
- D. Sweep concrete substrates to remove dirt, dust, debris, and loose particles.

3) INSTALLATION, GENERAL

- A. Install pavers as shown on the Drawings and in accordance to the manufacturers recommendations.
 - 1. Saturate with clean water before installing setting bed. Remove surface water.
 - 2. Apply bedding sand per manufacturer's specifications.
 - 3. Edges: mortar in the last 12" of pavers at the edge of the concrete base
 - 4. Joints: Install pavers hand-tight unless otherwise noted on drawings.
 - 5. Controls: Install pavers plumb, level on the undisturbed sand leveling bed and true to line and grade.
 - 6. Vibration: spread sand per manufacturer's specifications and vibrate/compact so that sand may be vibrated in the joints (for truncated dome pavers).
 - 7. Excess sand and gravel: Sweep into the joints or dispose off site.
- B. Do not use unit pavers with chips, cracks, voids, discolorations, or other defects that might be visible or cause staining in finished work.
- C. Mix pavers from several pallets or cubes, as they are placed, to produce uniform blend of colors and textures.
- D. Cut brick paving units with masonry saws to provide sharp, unchipped edges. Cut units as required to provide pattern shown in Materials Plan and details and to fit adjoining work neatly. Where cutting is required, use the largest size units possible. Avoid the use of small pieces of brick or large joint spaces.
- E. Joint Pattern: Herringbone, refer to drawings for details.

4) TOLERANCES:

- A. Do not permit finished paving surfaces to vary more than ¼ in. measured with a 20 ft. metal straightedge, except at grade changes.
- B. No ponding or other surface irregularities are permitted. Correct irregularities to satisfaction of Landscape Architect and Owner.

- C. Where corners of two or more pavers meet: a tolerance of up to $\frac{1}{2}$ " diameter (surface exposure of polymeric sand is permitted. Sand joints exceeding $\frac{1}{2}$ " will not be accepted.
- D. All polymeric sand joints shall be within $\frac{1}{8}$ " of the top over paver in all conditions.

END OF SECTION 321400

SITE FURNISHINGS**SECTION 323300****PART 30 - GENERAL****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.

2) SUMMARY**A. Section Includes:**

- 1. Seating.
- 2. Bicycle racks.
- 3. Trash and recycling receptacles.

B. Related Requirements:

- 1. Section 033000 "Cast-in-Place Concrete" for installing pipe sleeves cast, installing anchor bolts cast in concrete footings.
- 2. Section 312000 "Earth Moving" for excavation for installing concrete footings.
- 3. Section 321400 "Unit Paving"

3) ACTION SUBMITTALS

- A. Product Data and Cut Sheets: For each type of product.
- B. Samples for Verification: For each type of exposed finish, not less than 6-inch- (152-mm-) long linear components and 4-inch- (102-mm-) square sheet components.
- C. Shop Drawings: Show plans, elevations, with dimensions, details of inserts, joints, and reinforcements and connections to all adjoining work.

4) CLOSEOUT SUBMITTALS

- A. Maintenance Data: For site furnishings to include in maintenance manuals.

PART 31 - PRODUCTS

1) SEATING

A. Bench:

1. DuMor, Inc:
 - a. 58 SER-3AR, as detailed in construction drawings
 - b. Color: DuMor 'Black Finish'
 - c. Contractor to provide leveling screws for installation to ensure that the bench is level.
 - d. Install to manufacturer specifications.

2) BICYCLE RACKS

1. Dero Playcore:
 - a. Rolling Bike Rack RR3H as detailed in construction.
 - b. Custom, "City Green", as per City of Lewisville specifications
 - c. Install to manufacturer specifications.

B. TRASH RECEPTACLES

1. DuMor, Inc:
 - a. Receptacle Model 84, as detailed in construction drawings
 - b. Flat lid opening for trash
 - c. Trash only labeling for lid
 - d. 32-gallon plastic inner removable liner
 - e. Color: Black powder coat color
 - f. Bolt with stainless steel anchor bolts per City of Lewisville specifications.
2. Recycling Containers
 - a. Receptacle Model 84, as detailed in construction drawings
 - b. Dome Lid or similar lid providing cover from rain with two (2) 4-1/2" diameter openings for cans and bottles
 - c. "Cans and Bottles Only" labeling for lid
 - d. 32-gallon plastic inner removable liner
 - e. Color: Standard recycle green powder coat color
 - f. Bolt with stainless steel anchor bolts per City of Lewisville specifications.

PART 32 - EXECUTION

1) EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for correct and level finished grade, mounting surfaces, installation tolerances, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

2) INSTALLATION

- A. Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Complete field assembly of site furnishings where required.
- B. Unless otherwise indicated, install site furnishings after landscaping and paving have been completed.
- C. Install site furnishings level, plumb, true, and securely anchored, positioned at locations indicated on Drawings.

END OF SECTION 323300

SECTION 328000

LANDSCAPE IRRIGATION SYSTEM

PART 1 -- GENERAL

1.1 SCOPE:

- A. Furnish all work and materials, appliances, tools, equipment, facilities, transportation, and services necessary for and incidental to performing all operations in connection with the installation of underground sprinkler irrigation system complete, as shown on drawings and/or specified herein. When the term "Contractor" is used in this section, it shall refer to the irrigation Subcontractor.
- B. The contractor shall also reference "Irrigation Specifications for City Parks, Medians, and Facilities" as available through the City of Lewisville Parks Department for complete City Irrigation requirements.

1.2 QUALITY ASSURANCE:

The following Codes, Regulations, Reference Standards, and Specifications apply to work included in this section: ASTM: D2241, D2464, D2466, and D2564.

1.3 WARRANTY AND MAINTENANCE:

- A. The Contractor shall warranty material and workmanship for one year after final acceptance including repair and replacement of defective materials, workmanship, and repair of backfill settlement.
- B. Maintenance during warranty shall include, but not necessarily be limited to, the following:
 - 1. Adjustment of sprinkler height and plumb to compensate for settlement and/or plant growth.
 - 2. Backfilling of all trenches.
 - 3. Adjustment of head coverage (arc of spray) as necessary.
 - 4. Unstopping heads plugged by foreign material.
 - 5. Adjustment of controller as necessary to insure proper sequence and watering time.
 - 6. All maintenance necessary to keep the system in good operating order. Repair of damage caused by vandals, other contractors or weather conditions shall be considered extra to these specifications.
- C. Warranty and maintenance after final acceptance does not include alterations as necessitated by re-landscaping, re-grading, addition of trees or the addition, and/or changes in sidewalks, walls, driveways, etc.
- D. Maintenance shall continue for one month after final acceptance.

1.4 SUBMITTALS:

- A. The Contractor shall submit shop drawings or manufacturer's "cut sheet" for each type of sprinkler head, pipe, controller, valves, check valve assemblies, valve boxes, wire, conduit, fittings, and all other types of fixtures and equipment proposed to install on the job. The submittal shall include the manufacturer's name, model number, equipment capacity, and manufacturer's installation recommendation, if applicable, for each proposed item.
- B. No partial submittal will be accepted and submittals shall be neatly bound into a brochure and logically organized. After the submittal has been approved, substitutions will not be allowed except by written consent of the Landscape Architect.
- C. Shop drawings shall include dimensions, elevations, construction, details, arrangements, and capacity of equipment, as well as manufacturer's installation recommendations.

1.5 "APPROVED EQUAL" SUBSTITUTIONS:

Where items on the plans are specified by a manufacturer's brand name and catalog number, followed by the phrase "or approved equal". This is not intended to unduly restrict competitive procurements or bidding, but is done to assure a minimum standard of quality which is believed to be best for the item specified and to match existing equipment.

1.6 CODES/PERMITS:

- A. All work under this section shall comply with the provisions of these Specifications, as illustrated on the accompanying drawings, or as directed by the Owner and shall satisfy all applicable local codes, ordinances, or regulations of the governing bodies and all authorities having jurisdiction over this Project.
- B. Installation of equipment and materials shall be done in accordance with requirements of the National Electrical Code, City Plumbing Code, and standard plumbing procedures. The drawings and these Specifications are intended to comply with all the necessary rules and regulations; however, some discrepancies may occur, the Contractor shall immediately notify the Landscape Architect in writing of the discrepancies and apply for an interpretation. Should the discovery and notification occur after the execution of a contract, any additional work required for compliance with the regulations shall be paid for as covered by these Contract documents.
- C. The Contractor shall give all necessary notices, obtain all permits, and pay all costs in connection with his work; file with all governmental departments having jurisdiction; obtain all required certificates of inspection for his work and deliver to the Owner.
- D. The Contractor shall include in the work any labor, materials, services, apparatus, or drawings in order to comply with all applicable laws, ordinances, rules, and regulations whether or not shown on the drawings and/or specified.
- E. The installation of the irrigation system shall be made by an individual or firm duly licensed under Article No. 8751 VTCS, Titled "Licensed Irrigators Act", S.B. No. 259 as passed by the 66th Texas Legislature.

1.7 EXISTING UTILITIES:

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- A. Locations and elevations of various utilities included with the scope of this work have been obtained from the most reliable sources available and should serve as a general guide without guarantee to accuracy. The Contractor shall examine the Site and verify to his own satisfaction the locations and elevation of all utilities and availability of utilities and services required. The Contractor shall inform himself as to their relation to the work and the submission of bids shall be deemed as evidence thereof. The Contractor shall repair at his own expense, and to the satisfaction of the Owner, for damage to any utility shown or not shown on the plans.
- B. Should utilities not shown on the plans be found during excavations, Contractor shall promptly notify the Owner for instructions as to further action.
- C. Contractor shall make necessary adjustments in the layout as may be required to connect to existing stub-outs, should such stub-outs not be located exactly as shown and as may be required to work around existing work, at no increase in cost to the Owner. All such work will be recorded on record drawings and turned over to the Owner prior to final acceptance.

1.8 RECORD DRAWINGS:

- A. Record dimensioned locations and depths for each of the following:
 - 1. Point of connection.
 - 2. Sprinkler pressure line routing (provide dimensions for each 100 lineal feet (maximum) along each routing, and for each change in directions).
 - 3. Gate valves.
 - 4. Sprinkler control valves (buried only).
 - 5. Control wire routing.
 - 6. Other related items as may be directed by the Landscape Architect.
- B. Locate all dimensions from two permanent points (buildings, monuments, sidewalks, curbs, or pavements).
- C. Record all changes which are made from the Contract drawings, including changes in the pressure and non-pressure lines.
- D. Record all required information on a set of reproducible drawing files.
- E. Maintain information daily. Keep Contract drawings at the Worksite at all times and available for review by the Owner's representative.

1.9 CONTROLLER CHARTS:

- A. Do not prepare charts until record drawings have been approved by the Owner's representative.
- B. Provide one controller chart for each automatic controller installed.
 - 1. Chart may be a reproduction of the record drawing, if the scale permits fitting within the controller door. If photo reduction prints are required, keep reduction to maximum size possible to retain full legibility.

2. Chart shall be blackline print of the actual system, showing the area covered by that controller.
- C. Identify the area of coverage of each remote control valve, using a distinctly different pastel color, drawn over the entire area of coverage.
- D. Following approval of charts by the Owner's representative, they shall be hermetically sealed between two layers of 20 mil. thick plastic sheet.
- E. Charts must be completed and approved prior to final acceptance of the irrigation system.

1.10 OPERATING AND MAINTENANCE MANUALS:

- A. Provide individual bound manuals detailing operating and maintenance requirements for irrigation systems.
- B. Manuals shall be delivered to the Owner's representative for review and approval no later than 10 days prior to completion of work. Revise manual as required.
- C. Provide descriptions of all installed materials and systems in sufficient detail to permit maintenance personnel to understand, operate, and maintain the equipment.
- D. Provide the following in each manual:
 1. Index sheet, stating Irrigation Contractor's name, address, telephone number, and name of person to contact.
 2. Duration of guarantee period.
 3. Equipment list providing the following for each item:
 - a. Manufacturer's name.
 - b. Make and model number.
 - c. Name and address of local manufacturer's representative.
 - d. Spare parts list in detail.
 - e. Detailed operating and maintenance instructions of major equipment.
 4. Recommended programs for watering by season.

1.11 CHECKLIST:

- A. Provide a signed and dated checklist, and deliver to the Owner's representative prior to final acceptance of the work.
- B. Use the following format:
 1. Plumbing permits: if none required, so note.
 2. Material approvals: approved by and date.
 3. Pressure line tests: by whom and date.
 4. Record Drawings: received by and date.
 5. Controller charts: received by and date.
 6. Materials furnished: received by and date.
 7. Operation and maintenance manuals: received by and date.
 8. System and equipment operation instructions: received by and date.

9. Manufacturer's warranties if required: received by and date.
10. Written guarantee: received by and date.
11. Lowering of heads in lawn areas: if incomplete, so state.

1.12 ELECTRIC POWER:

Electric power shall be provided within five feet of each controller location by the G.C. The irrigation contractor shall provide final hardwire connection.

1.13 WATER FOR TESTING:

Unless noted otherwise on the plans or elsewhere, furnish all water necessary for testing, flushing, and jetting.

1.14 BORINGS, SLEEVES AND ELECTRICAL CONDUITS:

Sleeves and electrical conduits are the responsibility of the Irrigation Contractor to install prior to paving or related construction and should be installed as noted on the drawings and specifications. Contractors shall be responsible for locating all sleeves and conduits at no additional cost to the Authority. Borings under existing paving will be required where noted on the drawings and shall be provided at no additional cost to the Owner. Borings shall be a minimum of 18 inch depth and new pipes shall be incased in Class 200 sleeves.

1.15 SPARE PARTS:

The Contractor shall supply the Owner with five spray heads, one for each head designated on the plan. The Contractor shall supply one additional key and hose swivel for the quick coupler.

PART 2 -- PRODUCTS

2.1 GENERAL:

Unless otherwise noted on the plans, all materials shall be new and unused. The irrigation equipment catalog numbers used for reference in these Specifications are to establish minimum quality standards and may be substituted with an "approved equal" as outlined in Paragraph 1.5 of this section.

2.2 POLYVINYL CHLORIDE PIPE (PVC PIPE):

PVC pipe manufactured in accordance with ASTM Standards noted herein.

- A. Marking and Identification: PVC pipe shall be continuously and permanently marked with following information: Manufacturer's name, size, type of pipe, and material, SDR number, Product Standard number, and the NSF (National Sanitation Foundation) Seal.
- B. PVC pipe fittings: Shall be of the same material as the PVC pipe specified and compatible with PVC pipe furnished. Solvent weld type shall be Schedule 40.
- C. PVC Pipe: Shall be Class 200 solvent weld, SDR-21, PS 22-70 for all sizes 3/4 inch to 3 inches. All 1/2 inch pipe shall be solvent weld SDR- 13.5, Class 315. Mainline pipe size 4" and larger shall be PVC o-ring gasket type with ductile iron fittings by Harco Industries.
- D. Flexible PVC Risers (Nipples): All flexible PVC nipples shall be made from virgin PVC material, and shall comply with ASTM D2287, shall be tested at 200 P.S.I. static pressure for 2 hours and have a quick burst rating of a minimum 400 P.S.I. Flexible PVC pipe nipples shall be factory assembled only.
- E. Pipe sleeves: Shall be Class 200 solvent weld, SDR-21, PSD 22-70 for all sizes 3/4 inch to 2 inches; all 1/2 inch pipe shall be solvent weld SDR-13.5, Class 315; and located as shown on drawings.

2.3 SWING JOINTS:

Swing joints shall be O-ring seal type, Lasco or approved equal.

2.4 WIRE AND SPLICES:

- A. All valve wire shall be single strand solid copper, minimum 14 gauge with type UF insulation which is Underwriters Laboratory approved for direct underground burial when used in a National Electrical Code Class II Circuit (30 volts AC or less) as per Articles 725 and 300. Voltage drop shall be taken into consideration.
- B. All connectors shall be UL listed, rated 600 volt, for PVC insulated wire. No wire splices shall be buried.
- C. All wire connectors shall have a two-piece PVC housing which, when filled with resin epoxy and pressed together, forms a permanent, one-piece, moisture-proof wire splice.

2.5 QUICK COUPLING VALVES:

- A. Quick coupling valves shall be composed of a bronze cast body with a purple, (NP) cover.
- B. The valve shall accept a single lug 3/4 inch bronze valve key for operation.
- C. Provide one coupler and one hose swivel ell for every five quick coupling valves shown on the plans.

2.6 MANUAL VALVES:

- A. Manual valves 2-1/2 inches and smaller shall be all brass, globe type with composition disc rated at 150 pounds W.O.G. Manual valve size 4" and larger shall be Kennedy cast iron type.
- B. All valves shall have wheel handles unless cross handles are called for on the plan.

2.7 VALVE BOXES:

- A. A box shall be provided for all valves.
- B. Valve boxes shall be made of high-strength plastic suitable for turf irrigation purposes.
- C. Boxes shall be suitable in size and configuration for the operability and adjustment of the valve.
- D. Extension sections will be used as appropriate to the depth of piping.
- E. All valve box covers shall bolt down or have locking mechanisms and shall be colored green or black as selected by the Contracting Officer.

2.8 POP-UP SPRAY, BUBBLERS AND ROTARY HEADS:

- A. Sprinkler heads are specified on the drawings. Spray heads shall have a minimum 4 inch pop-up.
- B. The sprinkler body and all related parts shall be plastic cyclac or polycarbonate. They shall have a spring retraction for positive return action of the pop-up nozzle.
- C. The spring for retraction and the adjustable nozzle screw shall be made of corrosion resistant materials.

2.9 DRIP TUBE WITH PRESSURE COMPENSATING EMITTERS

Drip tube shall be of nominal sized one-half (1/2") inch low density, ultra-violet-resistant, linear polyethylene tubing with internal pressure-compensating, continuous self-cleaning, integral drippers at a specified interval. The tubing shall be brown in color throughout and shall conform to an outside diameter (O.D.) of 0.66" and an inside diameter (I.D.) of 0.56". The

dripper line shall be capable of a discharge rate of 0.4, 0.6, or 0.9 gallons per hour (GPH) between operating pressures of 7 - 70 psi for each individual dripper.

The individual continuous self-cleaning, pressure compensating drippers shall be welded to the inside of the tubing wall. The drippers shall be constructed of three individual pieces:

- A. A black-colored dripper containing a filtration system on the inlet side, compensation cell, and recessed chamber with a water outlet
- B. A hard plastic diaphragm retainer with color denoting discharge rate, with chamfered edges and a recessed groove in the center extending the full length of the diaphragm and,
- C. A flexible elastomer diaphragm that allows pressure to build up within the chamber to purge sediment or other debris that may not have been captured by the disc filter.

2.9.1 BARBED INSERT FITTINGS

All barbed insert fittings shall be constructed of molded, ultra-violet-resistant, black colored plastic having a nominal inside dimension (I.D.) of 0.24"

Each fitting shall have a minimum of two ridges or barbs per outlet with a raised barb nearest the fitting outlet. All fittings shall be of one manufacturer and shall be available in one of the following end configurations:

- barbed insert fittings,
- male pipe threads (MPT) with barbed insert fittings, or
- female pipe threads (FPT) with barbed insert fittings.

2.10 ELECTRIC CONTROLLER:

- A. Electric irrigation controller shall be capable of operating the number of stations as indicated on the drawings. The system is designed to operate multiple section valves at a time, per controller unless otherwise noted. The controller is specified on the drawings.
- B. Power source shall be 110v A.C. Output for operation of companion solenoid actuated valves shall be 24 volts 60 Cycle AC.
- C. Operation of the controller shall be full automatic, incorporating one 24 hour clock and 14 day calendar per controlled number of electric valves shown on the plan to start the sprinkling cycle any hour or hours of the day or night of any day or days over a repeating 14 day period.

- D. The controller shall be capable of repeating watering cycles as required with a maximum delay between the ending of one cycle and the beginning of the next not to exceed 2 hours. Control shall provide optional semi-automatic operation whereby the automatic cycle may be started independent of the clock and manual operation whereby any station may be operated by hand independent of all timing mechanism. The choice of automatic day or hour programming shall be available to the operator on the face of the control panel without the use of tools.
- E. The automatic controller shall be equipped with rainproof housing.

2.11 ELECTRIC REMOTE CONTROL VALVES:

- A. Electric remote control valves shall have plastic bodies and covers and shall be globe-type diaphragm valves of normally closed design. The valves are specified on the drawings.
- B. Operation shall be accomplished by means of integrally mounted heavy-duty 24-V DC solenoid complying with National Electrical Code, Class II Circuit. Solenoid coil shall be potted in epoxy resin within a plastic coated stainless steel housing. Solenoids shall be completely waterproof, suitable for direct underground burial.
- C. A flow stem adjustment shall be included in each valve.

2.12 BACKFLOW PREVENTER (DOUBLE CHECK VALVE):

- A. A double gate valve, double check assembly shall be located and sized as shown on the plans. The double check valve is specified on the drawings.
- B. Construction shall be all brass for sizes 3/4 inch to 2 inches.
- C. This assembly shall be installed in a box and shall conform to the City Plumbing Codes.

2.13 TEMPERATURE SENSORS & RAIN SENSORS:

- A. Rain and freeze sensors shall be provided and installed as noted on the plans.

PART 3 -- EXECUTION

3.1 INSTALLATION, GENERAL:

- A. Design Pressure: This irrigation system has been designed to operate with a minimum static inlet water pressure as indicated on the drawings. The Contractor shall take a pressure reading prior to beginning construction. If the pressure reading is 5% less than above, the Contractor shall notify the Owner's Representative.

- B. Contractor Responsibility: The Contractor shall not willfully install the irrigation system as shown on the drawings when it is obvious in the field that obstructions, grade differences or discrepancies in equipment usage, area dimensions or water pressure exist that might not have been considered in the engineering. Such obstructions or differences shall be brought to the attention of the Owner's Representative in writing. In the event this notification is not performed, the Contractor shall assume full responsibility for any revision necessary.
- C. Staking: Before installation is started, place a stake or flag where each sprinkler is to be located, in accordance with drawing. Staking shall be approved by the Landscape Architect before proceeding.
- D. Piping Layout: Piping layout is diagrammatic. Route piping around existing trees and root zones in such a manner as to avoid damage to plantings. Do not dig within the ball of newly planted trees or shrubs.
- E. In areas where trees are present, trenches will be adjusted on site to provide a minimum clearance of four times the trunk diameter of the tree (at its base) between any tree and any trench.
- F. All material and equipment shall be delivered to the Worksite in unbroken reels, cartons or other packaging to demonstrate that such material is new and of a quality and grade in keeping with the intent of these Specifications.

3.2 EXCAVATION AND TRENCHING:

- A. The Contractor shall perform all excavation to the depth indicated in these Specifications and Contract drawings. The banks of trenches shall be kept as nearly vertical as practicable. Trenches shall be wide enough to allow a minimum of 4" between parallel pipelines or electrical wiring. Where rock excavation is required, or where stones are encountered in the bottom of the trench that would create a concentrated pressure on the pipe, the rock or stones shall be removed to a depth of six (6) inches minimum below the trench depth indicated. The over depth rock excavation and all excess trench excavation shall be backfilled with loose, moist earth or sand, thoroughly tamped. Whenever wet or otherwise unstable soil that is incapable of properly supporting the pipe is encountered in the trench bottom, such shall be removed to a depth and length required, and the trench backfilled to trench bottom grade as hereinafter specified, with course sand, fine gravel or other suitable material.
- B. Bottom of trench grade shall be continued past ground surface deviations to avoid air pockets and low collection points in the line. The minimum cover specifications shall govern regardless of variations in ground surface profile and the occasional deeper excavation required at banks and other field conditions. Excavation shall be such that a uniform trench grade variation will occur in all cases where variations are necessary.
- C. Trench excavation shall comprise the satisfactory removal and disposition of all materials, and shall include all shoring and sheeting required to protect the excavation and to safeguard employees.
- D. During excavation, material suitable for backfilling shall be stockpiled in an orderly manner a sufficient distance back from edge of trenches to avoid overloading and prevent slides or cave-ins. Material unsuitable for backfilling shall be wasted as directed by the Owner's Representative. When excavated material is of a rocky nature

and the topsoil or any other layer of excavated material is suitable for pipe bedding and backfill in the vicinity of the pipe, such material shall be separately stockpiled for use in such bedding and pipe backfill operations, unless satisfactory imported material is used.

- E. All excavations and backfill shall be unclassified and covered in the basic bid. No additional compensation will be allowed for rock encountered.
- F. Restore all surfaces, existing underground installations, etc., damaged or cut as a result of the excavations to their original conditions in a manner acceptable to the Owner's Representative.

3.3 PIPE INSTALLATION:

- A. Sprinkler Mains: Sprinkler mains are that portion of piping from water source to electric valves. This portion of piping is subject to surges since it is a closed portion of the sprinkler system. Sprinkler mains shall be installed in a trench with a minimum of 18 inches of cover.
- B. Lateral Piping: Lateral piping is that portion of piping from electrical valve to sprinkler heads. This portion of piping is not subject to surges since it is an "open end" portion of the sprinkler system. Lateral piping shall be installed in a trench with a minimum of 12 inches of cover.

3.4 PVC PIPE AND FITTING ASSEMBLY:

- A. Solvent: Use only solvent recommended by manufacturer to make solvent-welded joints following standards noted herein. Thoroughly clean pipe and fittings of dirt, dust, and moisture with an approved PVC primer before applying solvent.
- B. PVC to Metal Connection: Work metal connections first. Use a non-hardening pipe dope such as Permatex No. 2 or "Teflon" tape on threaded PVC to metal joints. Use only light wrench pressure.
- C. Threaded PVC Connections: Where required, use threaded PVC adapters into which pipe may be welded.
- D. Remove lumber, rubbish, and rocks from trenches. Provide firm, uniform bearing for entire length of each pipeline to prevent uneven settlement. Wedging or blocking of pipe will not be permitted. Remove foreign matter or dirt from inside of pipe before welding, and keep piping clean during and after laying pipe.
- E. PVC pipe shall not be installed where there is water in the trench, nor shall PVC pipe be laid when temperature is 40 deg. F or below or when rain is imminent. PVC pipe will expand and contract as the temperature changes. Therefore, pipe shall be snaked from side to side of trench bottom to allow for expansion and contraction.

3.5 HYDROSTATIC TESTS:

Pressure Test: After the pipe is laid, the joints completed, and the trench partially backfilled, leaving the joints exposed for examination, the newly laid piping or any valved section of main pressure line piping shall, unless otherwise specified, be subjected for four

hours to a hydrostatic pressure test of normal city water pressure. Each valve shall be opened and closed during the test. Enclosed pipe, joints, fittings, and valves shall be carefully examined during the partially open trench test. Joints showing visible leakage shall be replaced or remade, as necessary. Cracked or defective pipe, joints, fittings, or valves discovered in consequence of this pressure test shall be repeated until the test results are satisfactory. All replacement and repair shall be at contractor's cost.

3.6 CONTROL WIRE INSTALLATION:

- A. All control wire less than 500 feet in length shall be continuous without splices or joints from the controller to the valves. Connections to the electric valves shall be made within 18 inches of the valve using connectors specified in Paragraph 2.4 of this section, unless otherwise approved by the Owner's Representative in writing.
- B. All control wires shall be installed at least 18 inches deep. Contractor shall obtain the Owner's Representative's approval for wire routing when installed in a separate ditch. Control wires may be installed in a common ditch with piping; however, wires must be installed a minimum of 4 inches below or to one side of piping.
- C. All wire passing under existing or future paving, sidewalk, construction, etc., shall be encased in PVC Schedule 40 conduit extending at least 2 feet beyond edges of paving, sidewalks, or construction.

3.7 POP-UP SPRAY, BUBBLER HEADS:

- A. Provide heads and nozzles as specified and install in locations as shown on the Contract Drawings.
- B. Pop-up spray heads shall be installed on "flex" pvc as detailed on the Contract drawings. Rotary heads shall be installed on a double swing joint connected to the lateral pipe as detailed on the drawings.
- C. Heads shall be installed with underside of flange flush with the finished grade.
- D. Contractor will be required to adjust heads as necessary after establishment of grass or other plant material.

3.8 DRIP EQUIPMENT:

- A. Drip tube can be installed in one of the four following methods:
 - Over-excavation: Over-excavate the entire area to a depth of 2" to 4" below finish grade. Plant all specimen trees and shrubs 15 gallon size and larger, then place drip tube at the row spacing interval indicated on the plans.
 - Pipe Pulling: Where ground disruption is to be minimized, pneumatic tire, pipe-pulling machinery shall be used. Potholes shall be used at the ends of each run for making connection to supply and exhaust headers of rigid PVC pipe or polyethylene pipe.
 - Trenching: Hand or mechanically trench to the pipe depth indicated on the plans or in these specifications and backfill flush with finish grade. Avoid mechanically trenching within the dripline of existing trees. Hand-trench around existing tree roots when roots of 2" and larger are encountered. Remove all rock 1½" and larger when excavating and remove from site. Do not backfill trenches with rock that will come in direct contact with tubing or rigid PVC piping.

- B. Placement of Rigid PVC Piping: Install pipe in a serpentine (snaked) manner to allow for expansion and contraction in trench before backfilling. Install pipes at temperatures over 40° F. Pipe markings shall face upward out of the trench whenever possible.
- C. Drip tube: Drip tube can be installed with the water outlets facing up, down, or sideways. In irregular areas, some water outlets could end up too close to fixed improvements and may have to be capped off with a dripper plug ring.
- D. Cover: Install underground piping horizontally and as evenly as possible to a maximum depth of 4", unless otherwise specified. (Typical pipe depth is 2" shrub beds, 4" in turf unless periodic aeration is anticipated, and then pipe depth should be lowered to 6".)
- E. Barbed Insert Fittings: Connect drip tube to barbed insert fittings by pushing the tubing on and over both barbs of the fitting until the tubing has seated against another piece of tubing or has butted against another portion of the barbed fitting. For water pressures in excess of the 30 psi, or the maximum stated system pressure for the drip tube, whichever is less, use stainless steel clamps as noted in paragraph 3.2.4, "Pipe Clamping" on all barbed fittings.
- F. Clamping: When design-operating pressure exceeds 30 psi, or maximum stated system pressure for the drip tube, whichever is less, stainless steel pipe clamps shall be used. Slip clamps over tubing before slipping tubing over barbed insert fitting. Place clamp between the first and second ridge of the barbed fittings and crimp the "ear" of the clamp tightly. Crimp the "ear" twice to ensure proper seating.

3.8 QUICK COUPLING VALVES:

- A. Quick coupling valves shall be installed with the underside of flange flush with the finished grade.
- B. Quick coupling valves shall be installed on a swing joint assembly as detailed on the drawings.
- C. Under the warranty, the Contractor shall return after grass is established and adjust valves and valve boxes to proper grade.

3.9 MANUAL VALVES:

- A. Manual valves shall be sized and located where shown on the Contract drawings.
- B. Valve boxes shall be adjusted to be flush with finished grade. The Contractor will be required to adjust after establishment of grass.
- C. Valve boxes shall be properly supported and of sufficient construction that tractors and mowers crossing over the boxes will not push boxes down and crush the pipe, valve, or box.

3.10 VALVE AND VALVE BOX PLACEMENT:

- A. All manual, electric, and quick coupling valves shall be in boxes as specified in Paragraph 2.7 of this section, and shall be set with a minimum of six (6) inches of space between

their top surface and the bottom of the valve box. The base of the box shall be filled with pea gravel as

- B. Valves shall be fully opened and fully closed to ensure that all parts are in operating condition.
- C. Valve boxes shall be set plumb, vertical, and concentric with the valve stem.
- D. Any valve box which has moved from this required position so as to prevent the use of the operating wheel of the valve shall be reset by the Contractor at his own expense.

3.11 ELECTRIC CONTROLLER:

- A. Electric controller shall be located as shown on the plans and shall be capable of operating the number of stations indicated.
- B. The system is designed to operate two sections at a time, per controller, unless otherwise noted on the plans in strict accordance with the manufacturer's published installation instructions.

3.12 ELECTRIC REMOTE CONTROL VALVES:

- A. Remote control valves shall be located and sized as shown on the plans. All electrical connections shall be made when the weather is dry with connection kits as specified in Paragraph 2.4 of this section in strict accordance with manufacturer's recommended procedures. All remote control valves shall be installed in a horizontal position, in accordance to the manufacturer's published installation instructions.
- B. It shall be the responsibility of the Contractor to furnish and install the proper size wire on each of the low voltage circuits from the master control center to the various electric remote control valves.
- C. Consideration shall be given to each circuit for allowance of voltage drop and economy consistent with accepted practices of electrical installation. Under no circumstances shall the voltage of any branch circuit be reduced more than proper due to length of run exceeding the maximum allowable for the wire size used.

3.13 BACKFILL AND COMPACTION:

- A. After system is operating and required tests and inspections have been made, the trenches shall be carefully backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, sand, gravel, soft shale, or other approved materials, free from large clods of earth or stone. Rock, broken concrete, or pavement, and large boulders shall not be used as backfill material. The backfill shall be thoroughly compacted and evened with the adjacent soil level.
- B. Compact trenches in areas to be planted by thoroughly flooding the backfill. Compact all other areas by flooding or hand tamping. The jetting process may be used in areas when flooding.
- C. Backfill for all trenches, regardless of the type of pipe covered, shall be compacted to a minimum of 90% density.

- D. Any trenches improperly backfilled, or where settlement occurs, shall be reopened to the depth required for compaction, then refilled and compacted with the surface restored to the required grade and left in a completed surface condition as described above.
- E. Specifically tamp backfill under heads and around the flange of heads for one foot (1') by a suitable means after trench backfill has dried from flooding to prevent heads loosening in the ground.

3.14 FINAL ADJUSTMENT:

- A. After installation has been completed, make final adjustment of sprinkler system prior to Owner's Representative's final inspection.
- B. Completely flush system to remove debris from lines by removing nozzle from heads on ends of lines and turning on system.
- C. Check sprinklers for proper operation and proper alignment for direction of throw.
- D. Check each section for operating pressure and balance to other sections by use of flow adjustment on top of each valve.
- E. Check nozzles for proper coverage. Prevailing wind conditions may indicate that arc or angle of spray should be other than as shown on drawings. In this case, change nozzles to provide correct coverage and furnish record data to Owner's Representative with each change.
- F. After system is thoroughly flushed and ready for operation, each section of sprinklers shall be adjusted to control pressure at heads. Use the following method, one section at a time:
 - 1. Remove last head on section and install a temporary riser above grade. Install tee with pressure gauge attached on top of riser and re-install head with nipple onto tee.
 - 2. Correct operating pressure at last head of each section as follows: Spray Heads - 30-35 psi.
 - 3. After replacing head, at grade, tamp thoroughly around head.
 - 4. Drip zone valve pressure regulating devices shall be set at not to exceed 40 psi.

3.15 CLEAN-UP:

- A. The Worksite shall be thoroughly cleaned of all waste materials and all unused or salvaged materials, equipment, tools, etc.
- B. After completion of the work, areas disturbed shall be leveled and the Worksite shall be raked clean and left in an orderly condition.

END OF SECTION

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SOIL PREPARATION**SECTION 329113**

PART 33 - GENERAL

1) RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract.

2) SUMMARY

- A. Section includes planting soils [**and layered soil assemblies**] specified by composition of the mixes.
- B. Rain Garden Planting Mix
- C. Related Requirements:
 - 1. Section 329200 "Turf and Grasses" for placing planting soil for turf and grasses.
 - 2. Section 329300 "Plants" for placing planting soil for plantings.

3) DEFINITIONS

- A. AAPFCO: Association of American Plant Food Control Officials.
- B. Backfill: The earth used to replace or the act of replacing earth in an excavation. This can be amended or unamended soil as indicated.
- C. CEC: Cation exchange capacity.
- D. Compost: The product resulting from the controlled biological decomposition of organic material that has been sanitized through the generation of heat and stabilized to the point that it is beneficial to plant growth.
- E. Duff Layer: A surface layer of soil, typical of forested areas, that is composed of mostly decayed leaves, twigs, and detritus.
- F. Imported Soil: Soil that is transported to Project site for use.
- G. Layered Soil Assembly: A designed series of planting soils, layered on each other, that together produce an environment for plant growth.
- H. Manufactured Soil: Soil produced by blending soils, sand, stabilized organic soil amendments, and other materials to produce planting soil.

- I. NAPT: North American Proficiency Testing Program. An SSSA program to assist soil-, plant-, and water-testing laboratories through interlaboratory sample exchanges and statistical evaluation of analytical data.
 - J. Organic Matter: The total of organic materials in soil exclusive of undecayed plant and animal tissues, their partial decomposition products, and the soil biomass; also called "humus" or "soil organic matter."
 - K. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified as specified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
 - L. RCRA Metals: Hazardous metals identified by the EPA under the Resource Conservation and Recovery Act.
 - M. SSSA: Soil Science Society of America.
 - N. Subgrade: Surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.
 - O. Subsoil: Soil beneath the level of subgrade; soil beneath the topsoil layers of a naturally occurring soil profile, typified by less than 1 percent organic matter and few soil organisms.
 - P. Surface Soil: Soil that is present at the top layer of the existing soil profile. In undisturbed areas, surface soil is typically called "topsoil"; but in disturbed areas such as urban environments, the surface soil can be subsoil.
 - Q. USCC: U.S. Composting Council.
- 4) PREINSTALLATION MEETINGS
- A. Preinstallation Conference: Conduct conference at Project site. Conference participants shall include but are not limited to the General Contractor, Landscape Contractor and Soil Mixing Contractor.
- 5) ACTION SUBMITTALS
- A. Product Data: For each type of product.
 - 1. Include recommendations for application and use.
 - 2. Include test data substantiating that products comply with requirements.
 - 3. Include sieve analyses for aggregate materials.
 - 4. Material Certificates: For each type of imported soil and soil amendment and fertilizer before delivery to the site, according to the following:

- a. Manufacturer's qualified testing agency's certified analysis of standard products.
 - b. Analysis of fertilizers, by a qualified testing agency, made according to AAPFCO methods for testing and labeling and according to AAPFCO's SUIP #25.
 - c. Analysis of compost
 - d. Analysis of nonstandard materials, by a qualified testing agency, made according to SSSA methods, where applicable.
- B. Samples: For each bulk-supplied material, 1-quart (1-L) volume of each in sealed containers labeled with content, source, and date obtained. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of composition, color, and texture.
- 6) INFORMATIONAL SUBMITTALS
- A. Qualification Data: For each testing agency.
 - B. Preconstruction Test Reports: For preconstruction soil analyses specified in "Preconstruction Testing" Article.
 - C. Field quality-control reports.
- 7) QUALITY ASSURANCE
- A. The Landscape Contractor shall prepare and present to the landscape architect required soil submittals, and their associated specified test results, three months prior to the schedule soil and plant installation for proper lead time for material location, initial soil mix testing and approval
 - B. The Landscape Contractor shall have a minimum of three to five years of experience in installing designed soil mixes.
 - C. The Soil Mixing Contractor shall be able to provide soil mixes that meet the specifications within tolerances ascribed and be able to produce enough consistently uniform soil material for the project to meet the schedule demands
 - D. The Soil Mixing Contractor shall be engaged at least six months prior to scheduled soil installation; to allow for sufficient time for material searches and initial planting mix approval.
 - E. Testing Agency Qualifications: An independent, state-operated, or university-operated laboratory; experienced in soil science, soil testing, and plant nutrition; with the experience and capability to conduct the testing indicated; and that specializes in types of tests to be performed.

1. Laboratories: Subject to compliance with requirements, provide testing by the following:
 - a. Texas Plant and Soil Lab – 5115 West Monte Cristo Rd., Edinburg, TX 78541.

8) PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction soil analyses on existing, on-site soil, and imported soil.
 1. Notify Landscape Architect seven days in advance of the dates and times when laboratory samples will be taken.
- B. Preconstruction Soil Analyses: For each unamended soil type, perform testing on soil samples and furnish soil analysis and a written report containing soil-amendment and fertilizer recommendations by a qualified testing agency performing the testing according to "Soil-Sampling Requirements" and "Testing Requirements" articles.
 1. Have testing agency identify and label samples and test reports according to sample collection and labeling requirements.

9) SOIL-SAMPLING REQUIREMENTS

- A. General: Extract soil samples according to requirements in this article.
- B. Sample Collection and Labeling: Have samples taken and labeled by state-certified, -licensed, or -registered soil scientist or geotechnical engineer.

10) TESTING REQUIREMENTS

- A. General: Perform tests on soil samples according to requirements in this article.
 1. 90 days prior to preparing soil beds, the Contractor shall test and provide soil samples for all planting soils. Tests shall include the items outlined below. The specified tests shall be performed after test results for the composted organic material have been accepted.
 2. A minimum of 7 days prior to installation, Contractor shall provide tests for each planting soil batch or every 500 cubic yards of individual soil types to be used in the job site. Test shall be for soil mix quality assurance to maintain adherence to particle size distribution, pH, organic matter, and salts.
 3. One-liter soil samples should be provided to the Landscape Architect for each soil tested and labeled to include the corresponding soil test number, manufacturer or supplier and address of the location of source materials or stockpile.
- B. Physical Testing:

1. Soil Texture: Soil-particle, size-distribution analysis by the following methods according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods":
 - a. Sieving Method: Report sand-gradation percentages for very coarse, coarse, medium, fine, and very fine sand; and fragment-gradation (gravel) percentages for fine, medium, and coarse fragments; according to USDA sand and fragment sizes.
 - b. Hydrometer Method: Report percentages of sand, silt, and clay.
 2. Total Porosity: Calculate using particle density and bulk density according to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
 3. Water Retention: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods."
 4. Saturated Hydraulic Conductivity: According to SSSA's "Methods of Soil Analysis - Part 1-Physical and Mineralogical Methods"; at 85% compaction according to ASTM D 698 (Standard Proctor).
- C. Chemical Testing:
1. CEC: Analysis by sodium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."
 2. Clay Mineralogy: Analysis and estimated percentage of expandable clay minerals using CEC by ammonium saturation at pH 7 according to SSSA's "Methods of Soil Analysis - Part 1- Physical and Mineralogical Methods."
 3. Metals Hazardous to Human Health: Test for presence and quantities of RCRA metals including aluminum, arsenic, barium, copper, cadmium, chromium, cobalt, lead, lithium, and vanadium. If RCRA metals are present, include recommendations for corrective action.
 4. Phytotoxicity: Test for plant-available concentrations of phytotoxic minerals including aluminum, arsenic, barium, cadmium, chlorides, chromium, cobalt, copper, lead, lithium, mercury, nickel, selenium, silver, sodium, strontium, tin, titanium, vanadium, and zinc.
- D. Fertility Testing: Soil-fertility analysis according to standard laboratory protocol of SSSA NAFT SERA-6, including the following:
1. Percentage of organic matter content loss on ignition
 2. CEC, calcium percent of CEC, and magnesium percent of CEC.
 3. Soil reaction (acidity/alkalinity pH value).
 4. Buffered acidity or alkalinity.
 5. Nitrogen ppm.
 6. Phosphorous ppm.
 7. Potassium ppm.
 8. Manganese ppm.
 9. Manganese-availability ppm.
 10. Zinc ppm.
 11. Zinc availability ppm.

12. Copper ppm.
 13. Sodium ppm.
 14. Soluble-salts ppm.
 15. Presence and quantities of problem materials including salts and metals cited in the Standard protocol. If such problem materials are present, provide additional recommendations for corrective action.
 16. Other deleterious materials, including their characteristics and content of each.
- E. Organic-Matter Content: Analysis using loss-by-ignition method according to SSSA's "Methods of Soil Analysis - Part 3- Chemical Methods."
- F. Recommendations: Based on the test results, state recommendations for soil treatments and soil amendments to be incorporated to produce satisfactory planting soil suitable for healthy, viable plants indicated. Include, at a minimum, recommendations for nitrogen, phosphorous, and potassium fertilization, and for micronutrients.
- G. Permeability of the subgrade shall be tested, for at least three locations within each defined planting area. The Landscape Architect shall specify locations and numbers of tests based on the complexity of each planting area. Subgrade permeability is to be tested using a double ring infiltrometer and should be conducted by a soil scientist or geotechnical engineer.
- H. Submit the compost manufacturer's particle size analysis, pH, and certificate of length of composting period for all compost, organic amendment, and other organic materials. Compost shall be leaf and yard waste. Submit results of the Solvita compost maturity test.
- I. Soil moisture testing required prior to soil placement shall be by gravimetric oven dry method, as described in SSSA, Methods of Soil Analysis, Part 1, 1986. Soil moisture is to be tested by a soil scientist or geotechnical engineer.
- J. The Landscape Architect may request additional testing by the Contractor for confirmation of mix quality and/or soil mix amendments at any time until completion.
- 11) DELIVERY, STORAGE, AND HANDLING
- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and compliance with state and Federal laws if applicable.
- B. Bulk Materials:
1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials, discharge of soil-bearing water runoff, and airborne dust reaching adjacent properties, water conveyance systems, or walkways.

3. Do not move or handle materials when they are wet or frozen.
4. Accompany each delivery of bulk fertilizers and soil amendments with appropriate certificates.

PART 34 - PRODUCTS

1) MATERIALS

- A. Regional Materials: Imported soil, manufactured planting soil and soil amendments shall be manufactured within 50 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 50 miles of Project site.
- B. Imported topsoil or manufactured soil blends designed to serve as topsoil may not be mined from the following:
 1. Greenfield sites, unless soils are the waste by-product of a construction process
 2. Soils defined by the Natural Resource Conservation Service as prime farmland, unique farmland, farmland of statewide importance or local importance.
 3. Bogs, wetlands, or marshes
- C. Imported soil, soil amendments and fertilizers shall not contain the following materials:
 1. Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
 2. No coarse fragments such as building debris, concrete, stones, lumps of soil, sticks, roots, trash or other extraneous materials larger than 1.0 inches (40 mm) in diameter.
 3. Nuisance weeds or invasive plants including but not limited to bermudagrass, quackgrass, johnsongrass, nutsedge, poison ivy, bindweed and brome grass.
 4. Undesirable organisms or disease-causing plant pathogens.
 5. Sphagnum peat or muck peat
- D. High clay content subsoils or soils with redoximorphic features (mottled) are not acceptable

2) PLANTING SOILS SPECIFIED BY COMPOSITION

- A. General: Soil amendments, fertilizers, and rates of application specified in this article are guidelines that may need revision based on testing laboratory's recommendations after preconstruction soil analyses are performed.
- B. Turf/Sod Planting Areas: Provide depth of 4" topsoil/organic mix.
- C. Planting-Soil Type 1: The soil shall be a uniform mix, free of stones, stumps, roots or other similar objects larger than two inches. No other materials or substances shall be mixed or dumped within the soil type 1 area that may be harmful to plant growth or prove

a hindrance to the planting or maintenance operations. The planting soil shall be free of noxious weeds. The planting soil shall be tested per ASTM D4972 and shall meet the following criteria:

- a. Minimum 12-inch depth
- b. Sandy clay loam according to USDA textures. Clay content shall not exceed 25 percent.
- c. Soil pH between 6.0 – 6.5
- d. Organic matter content of 3 - 5%, dry weight basis
- e. Soluble salt concentrations shall not exceed 1.5 dS/m
- f. Sodium adsorption ratio (SAR) shall be <5
- g. Sufficient structure to give good tilth and aeration
- h. An infiltration rate of 3 inches per hour
- i. Soil shall not be compacted beyond the maximum allowable bulk density of 1.60 g/cm³ or 80 percent maximum dry density Standard Proctor.
- j. Subsoils - Existing subsoils scarified and or amended with sand or gravel if needed to have an infiltration rate of 0.5 inches per hour.

D. Soil Type 2: Rain Garden Planting:

1. The soil shall be a uniform mix, free of stones, stumps, roots or other similar objects larger than two inches. No other materials or substances shall be mixed or dumped within the bioswale area that may be harmful to plant growth or prove a hindrance to the planting or maintenance operations. The planting soil shall be free of noxious weeds. The planting soil shall be tested per ASTM D4972 and shall meet the following criteria:
 - a. pH range 6.0 – 6.5
 - b. organic matter 3 - 5%
 - c. magnesium 35 lb./ac
 - d. phosphorus P₂O₅ 75lb./ac
 - e. potassium K₂O 85lb./ac
 - f. soluble salts not to exceed 500 ppm
2. All rain garden areas shall have a minimum of one test. Each test shall consist of both the standard soil test for pH, phosphorus, and potassium and additional tests of organic matter, and soluble salts. A textural analysis is required from the site stockpiled topsoil. If topsoil is imported, then a texture analysis shall be performed for each location where the top soil was excavated. Since different labs calibrate their testing equipment differently, all testing results shall come from the same testing facility. Should the pH fall out of the acceptable range, it may be modified (higher) with lime or (lower) with iron sulfate plus sulfur.
3. Rain garden soil mix shall meet desired percolation rates whereby 6" of ponding water shall drain within 48 hours.
 - a. 70% medium to sharp sand (0.25-1.0mm)
 - b. 20% compost
 - c. 10% sandy loam topsoil
4. Refer to detail 9.11 and 9.12 in Drawings.

5. Sources: Take imported, unamended soil from sources that are naturally well-drained sites where topsoil occurs at least 4 inches deep and that do not contain undesirable organisms; disease-causing plant pathogens; or obnoxious weeds and invasive plants including, but not limited to, quackgrass, Johnsongrass, poison ivy, nutsedge, nimblewill, Canada thistle, bindweed, bentgrass, wild garlic, ground ivy, perennial sorrel, and bromegrass.
6. Additional Properties of Imported Soil before Amending: Soil reaction of [**pH 6 to 6.5**] and minimum of **2-3** percent organic-matter content, friable, and with sufficient structure to give good tilth and aeration.
7. Unacceptable Properties: Clean soil of the following:
 - a. Unacceptable Materials: Concrete slurry, concrete layers or chunks, cement, plaster, building debris, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, acid, and other extraneous materials that are harmful to plant growth.
 - b. Unsuitable Materials: Stones, roots, plants, sod, clay lumps, and pockets of coarse sand that exceed a combined maximum of 8 percent by dry weight of the imported soil.
 - c. Large Materials: Stones, clods, roots, clay lumps, and pockets of coarse sand exceeding 2 inches in any dimension.

3) INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural liming material containing a minimum of 80 percent calcium carbonate equivalent and as follows:
 1. Class: T, with a minimum of 99 percent passing through a No. 8 (2.36-mm) sieve and a minimum of 75 percent passing through a No. 60 (0.25-mm) sieve.
 2. Form: Provide lime in form of ground dolomitic limestone, calcitic limestone, or mollusk shells.
- B. Sulfur: Granular, biodegradable, and containing a minimum of 90 percent elemental sulfur, with a minimum of 99 percent passing through a No. 6 (3.35-mm) sieve and a maximum of 10 percent passing through a No. 40 (0.425-mm) sieve.
- C. Iron Sulfate: Granulated ferrous sulfate containing a minimum of 20 percent iron and 10 percent sulfur.
- D. Perlite: Horticultural perlite, soil amendment grade.
- E. Agricultural Gypsum: Minimum 90 percent calcium sulfate, finely ground with 90 percent passing through a No. 50 (0.30-mm) sieve.
- F. Sand: Coarse concrete sand, clean, washed, natural or manufactured, free of toxic materials, and according to ASTM C 33/C 33M. This material is used in conjunction with bioswales.

4) ORGANIC SOIL AMENDMENTS

- A. Compost: Well-composted, stable, and weed-free organic matter produced by composting feedstock, and bearing USCC's "Seal of Testing Assurance," and as follows:
1. Compost shall come from local feedstock manufactured within 50 miles of the project site.
 2. Feedstock: leaf, brush, and yard waste trimmings
 3. Reaction: pH 5.5 to 8.0
 4. Soluble-Salt Concentration: Shall not exceed 1.5 mS/cm
 5. Organic-Matter Content: The organic material shall contain at least 40% organic matter (dry basis) and shall have 100% passing a ½ inch or smaller screen. Debris particles such as metal, glass, plastic, wood, asphalt, or masonry shall not exceed 10 mm jn size and shall not total more than 2% dry weight.
 6. The carbon to nitrogen ration shall be between 11/1 and 22/1.
 7. Maturity shall be greater than or equal to 6 “curing compost and very stable” as measured in a colorimetric based maturity test (Woods End Research Laboratory, or equivalent).
 8. The composed material shall not produce any unpleasant residual odor such as hydrogen sulfide, ammonia, or others.
 9. The material shall contain some nitrogen, phosphorus, potassium, calcium, magnesium, sodium, and micronutrients including iron, copper, boron, manganese and molybdenum so that heavy applications of fertilizer are not required to sustain growth.
 10. Concentrations of zinc, mercury, cadmium, lead, nickel, chromium, and copper must be below EPA and Texas Commission on Environmental Quality standards for applications to soils with human activity.

5) FERTILIZERS

- A. Develop a list of organic or slow-release fertilizer products for use on the project site. Submit the list to the Owner’s Designated Representative for approval prior to use.
- B. Only organic fertilizers shall be used. All fertilizers shall be certified by Organic Material Review Institute (OMRI).
1. Composition: Macro and micro soil nutrients in amounts recommended in soil reports from a qualified testing agency.
- C. Chelated Iron: In amounts recommended in soil reports from a qualified testing agency. Commercial-grade FeEDDHA for dicots and woody plants, and commercial-grade FeDTPA for ornamental grasses and monocots.

PART 35 - EXECUTION

1) GENERAL

- A. Notify the landscape architect 10 days in advance of soil installation. Inspection shall take place during the placement of the planting soils layers while the subsoil is still visible, and another inspection shall take place during installation of the topsoil layer.

2) MIXING

- A. Mix soil base, amendments and chemical additives by mechanical means. Do not mix additives with excavated material at the plant pit site.
- B. Thoroughly mix all amendments in specified proportions prior to installation. Mix may be pre-blended or blended on site. Mix shall be approved by landscape architect prior to installation.
- C. Soil and sand bases shall be completely pulverized and free of lumps or aggregated material. Moisture content of base materials shall not be such that chemical, granular or pelletized additives become dissolved during the mixing process.
- D. Mix media in quantities of not less than 50 cubic yards or mix total quantity required, if less than 100 cubic yards. The Contractor shall be responsible for continuity between batches.
- E. For soil media mixes, do not incorporate soil from mixing area with mix.
- F. Coordinate activities with other project contractors so that there is no soil disturbance from traffic or other construction activities subsequent to placement. The Contractor shall place barricades as required to prevent any unnecessary compaction of planting soil from vehicles, equipment, or pedestrian traffic.
- G. Soil materials shall be covered two weeks prior to installation to prevent excess moisture from saturating the soil stockpile.
- H. Place planting soil and fertilizers according to requirements in other Specification Sections.
- I. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in planting soil.
- J. Use low-impact equipment with track belts, large tires, or low tire pressure to lower compaction and soil damage. All equipment to grade and move the soils shall be rated for ground pressure of 5 psi or lower. Submit list of low-impact equipment with the corresponding ground pressure psi to Landscape Architect for approval prior to use.

1. Back-blading the topsoil will orient soil particles, causing over compaction. Back-blading is prohibited.
- K. Proceed with placement only after unsatisfactory conditions have been corrected.
- L. Mixing of planting soil
1. Compost may be evenly blended with a bucket to achieve appropriate organic matter content levels. Windrowing the material is not acceptable, as it does not produce uniform mixing of the components.
 2. Do not work soils that are greater than 10 percent moisture. Compost shall be moist, but not so wet that water can be squeezed out by hand or so dry as to be easily blown by wind.
- 3) PLACING PLANTING SOIL OVER EXPOSED SUBGRADE
- A. General: Apply soil on-site in its final, blended condition. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
- B. The subgrade shall be examined by the Contractor and Landscape Architect prior to the start of soil placement and planting. Any deficiencies shall be noted and related to the Owner in writing prior to acceptance of the subgrade by the Landscape Contractor. Deficiencies include, but shall not be limited to:
1. Construction debris present in planting area.
 2. The subgrade is at incorrect depths for installing the design soil profile.
 3. There is incomplete irrigation and/or subsurface drainage installation.
- C. Prior to placing any soils, scarify the compacted surface of the subgrade to a depth of 6 to 8 inches. The subgrade shall have a permeability of not less than 0.5 inches/hour. Determine permeability of the subgrade using a double ring infiltrometer method after it has been scarified. A soil scientist or geotechnical engineer should conduct permeability test. If infiltration of the subgrade is below 0.5 in/hour, scarify perpendicular to previous scarification to a depth of 8 to 12 inches and retest for infiltration. Remove sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
- D. Application: Spread planting soil to a depth as indicated on Drawings but not less than required to meet finish grades after natural settlement.
1. Lifts: Apply planting soil in lifts not exceeding 12 inches loose depth for material compacted by compaction equipment, and not more than 6 inches in loose depth for material compacted by hand-operated tampers.
- E. Compaction: Compact each lift of planting soil to 75 to 80 percent of maximum dry density Standard Proctor according to ASTM D 698 except where a different compaction value is indicated on Drawings.
- F. Finish Grading: Grade planting soil to a smooth, uniform surface plane with loose, uniformly fine texture. Rake, remove ridges, and fill depressions to meet finish grades.

- 4) APPLYING COMPOST TO SURFACE OF PLANTING SOIL
- A. Application: In turf grass areas apply 1 inches of composted yard waste to surface of planting soil and lightly till into the top 4 inches of the topsoil. Till adequately to avoid forming a compost layer at the soil surface however, caution should be taken not to over cultivate the soil and break it down into small particles. Compost should be stable and mature, meeting the specification provided in Section 2.4. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
 - B. Application: In tree, shrub and herbaceous planting beds apply 3 inches of composted yard waste to surface of planting soil and lightly till into the top 4 inches of the topsoil. Till adequately to avoid forming a compost layer at the soil surface however, caution should be taken not to over cultivate the soil and break it down into small particles. Compost should be stable and mature, meeting the specification provided in Section 2.4. Do not apply materials or till if existing soil or subgrade is frozen, muddy, or excessively wet.
 - C. Finish Grading: Grade surface to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.
- 5) FIELD QUALITY CONTROL
- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
 - B. Perform the following tests and inspections:
 - 1. Compaction: Test planting-soil compaction after placing each lift and at completion using a densitometer or soil-compaction meter calibrated to a reference test value based on laboratory testing according to ASTM D 698. Space tests at no less than one for each 1000 sq. ft. of in-place soil or part thereof.
 - 2. Infiltration: Topsoil (horizon A) shall have an infiltration rate of 3 inches per hour. The subgrade shall have a minimum infiltration rate of 0.5 inches/hour. Determine permeability of the subgrade using a double ring infiltrometer method after it has been scarified.
 - C. Soil will be considered defective if it does not pass tests and inspections.
 - D. Prepare test and inspection reports.
 - E. Label each sample and test report with the date, location keyed to a site plan or other location system, visible conditions when and where sample was taken, and sampling depth.

6) PROTECTION

- A. Protection Zone: Identify protection zones according to Section 015639 "Temporary Tree and Plant Protection."
- B. Protect areas of in-place soil from additional compaction, disturbance, and contamination. Prohibit the following practices within these areas except as required to perform planting operations:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Vehicle traffic.
 - 4. Foot traffic.
 - 5. Erection of sheds or structures.
 - 6. Impoundment of water.
 - 7. Excavation or other digging unless otherwise indicated.
- C. If planting soil or subgrade is overcompacted, disturbed, or contaminated by foreign or deleterious materials or liquids, remove the planting soil and contamination; restore the subgrade as directed by Landscape Architect and replace contaminated planting soil with new planting soil.

7) CLEANING

- A. Protect areas adjacent to planting-soil preparation and placement areas from contamination. Keep adjacent paving and construction clean and work area in an orderly condition.
- B. Remove surplus soil and waste material including excess subsoil, unsuitable materials, trash, and debris and legally dispose of them off Owner's property unless otherwise indicated.
 - 1. Dispose of excess subsoil and unsuitable materials on-site where directed by Owner.

END OF SECTION 329113

TURF AND GRASSES**SECTION 329200**

PART 36 - GENERAL

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.

2) SUMMARY

A. Section Includes:

- 1. Seeding.
- 2. Sodding.
- 3. Meadows and Wildflowers.
- 4. Turf renovation.

B. Related Requirements:

- 1. Section 329300 "Plants" for trees, shrubs, ground covers, and other plants as well as border edgings and mow strips.
- 2. Section 329113 "Soil Preparation" for fertilizer and pesticides in turf and seed areas and soil mixes.

3) DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.

- E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

4) INFORMATIONAL SUBMITTALS

- A. Qualification Data: For landscape Installer.
- B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.
 - 1. Certification of each seed mixture for turfgrass sod. Include identification of source and name and telephone number of supplier.
- C. Product Certificates: For fertilizers, from manufacturer.
- D. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

5) CLOSEOUT SUBMITTALS

- A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of turf and meadows/wildflower during a calendar year. Submit before expiration of required maintenance periods.

6) QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful turf and meadow/wildflower establishment.
 - 1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
 - 2. Experience: Three years' experience in turf installation
 - 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 - 4. Personnel Certifications: Installer's field supervisor shall have certification in one of the following categories from the Professional Landcare Network:
 - a. Landscape Industry Certified Technician - Exterior.
 - b. Landscape Industry Certified Lawncare Manager.
 - c. Landscape Industry Certified Lawncare Technician.
 - 5. Pesticide Applicator: State licensed, commercial.

- 7) DELIVERY, STORAGE, AND HANDLING
- A. Seed and Other Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.
 - B. Sod: Deliver sod within 24 hours of harvesting and in time for planting promptly. Protect sod from breakage and drying.
- 8) PROJECT/SITE CONDITIONS
- A. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.
 - B. Do not broadcast hydroseed during a rain event.
 - C. Do not roll sod when soils are saturated with water or muddy. Soils should be damp and free of obstructions.

PART 37 - PRODUCTS

- 1) TURFGRASS SOD
- A. Turfgrass Sod: Approved, including limitations on thatch, weeds, diseases, nematodes, and insects, complying with "Specifications for Turfgrass Sod Materials" in TPI's "Guideline Specifications to Turfgrass Sodding." Furnish viable sod of uniform density, color, and texture that is strongly rooted and capable of vigorous growth and development when planted.
 - B. Turfgrass Species: Bermudagrass (*Cynodon dactylon*)
- 2) MEADOW GRASSES AND WILDFLOWERS
- A. Wildflower and Native-Grass Seed as per Native American Seed or approved equal.
 - B. Wildflower and Native-Grass Seed: Fresh, clean, and dry new seed, of mixed species as follows:
 1. Texas – Oklahoma Roadside Mix from Native American Seed. Use manufacturers square footage estimates per container size. Seed mix contains Texas Bluebonnet, Indian Blanket, Greenthread, Plains Coreopsis, Clasping Coneflower, Golden-Wave, Lanceleaf Coreopsis, Purple Coneflower, Scarlet Sage, Lemon Mint, Purple Prairie Clover, Cutleaf Daisy, Huisache Daisy, Missouri Primrose, Black-Eyed

Susan, Texas Yellow Star, Pink Evening Primrose, Mexican Hat, Bush Sunflower, Prairie Coneflower, Indian Paintbrush, Winecup.

C. Seed Carrier: As per manufacturer's recommendations.

3) FERTILIZERS

A. Develop a list of organic or slow-release fertilizer products for use on the project site. Submit the list to the Owner's Designated Representative for approval prior to use.

B. Only organic fertilizers shall be used. All fertilizers shall be certified by Organic Material Review Institute (OMRI).

1. Composition: Macro and micro soil nutrients in amounts recommended in soil reports from a qualified testing agency.

C. Chelated Iron: In amounts recommended in soil reports from a qualified testing agency. Commercial-grade FeEDDHA for dicots and woody plants, and commercial-grade FeDTPA for ornamental grasses and monocots.

4) MULCHES

A. Refer to section 329300 "Plants" for Mulch specifications and to drawings for locations and details.

5) PESTICIDES

A. General: Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

6) EROSION-CONTROL MATERIALS

A. Refer to Civil Engineer drawings and specifications.

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PART 38 - EXECUTION

1) EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 3. Uniformly moisten excessively dry soil that is not workable or which is dusty.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

2) PREPARATION

- A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3) TURF AREA PREPARATION

- A. General: Prepare planting area for soil placement and mix planting soil according to **Section 329113 "Soil Preparation."**
 - 1. Reduce elevation of planting soil to allow for soil thickness of sod.
- B. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- C. Before planting, obtain Landscape Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

4) PREPARATION FOR EROSION-CONTROL MATERIALS

- A. Prepare area as specified in "Turf Area Preparation" Article.
- B. For erosion-control refer to civil.

5) SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h).
 - 1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 - 2. Do not use wet seed or seed that is moldy or otherwise damaged.
 - 3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
- B. Sow seed at a total rate of 2 lb/1000 sq. ft. (0.9 kg/92.9 sq. m) for wildflower mix 1 and 3 to 4 lb/1000 sq. ft. (1.4 to 1.8 kg/92.9 sq. m).
- C. Rake seed lightly into top 1/8 inch (3 mm) of soil, roll lightly, and water with fine spray.
- D. Protect seeded areas with slopes exceeding 1:4 with erosion-control blankets and 1:6 with erosion-control fiber mesh installed and stapled according to manufacturer's written instructions.
- E. Protect seeded areas from hot, dry weather or drying winds by applying planting soil within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch (4.8 mm), and roll surface smooth.

6) SODDING

- A. Lay sod within 24 hours of harvesting unless a suitable preservation method is accepted by Architect prior to delivery time. Do not lay sod if dormant or if ground is frozen or muddy.
- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to soil or sod during installation. Tamp and roll lightly to ensure contact with soil, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
 - 1. Lay sod across slopes exceeding 1:3.

- C. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches (38 mm) below sod.

7) TURF RENOVATION

- A. Renovate existing turf where indicated.
- B. Renovate turf damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.
 - 1. Reestablish turf where settlement or washouts occur or where minor regrading is required.
 - 2. Install new planting soil as required.
- C. Remove sod and vegetation from diseased or unsatisfactory turf areas; do not bury in soil.
- D. Remove topsoil containing foreign materials, such as oil drippings, fuel spills, stones, gravel, and other construction materials resulting from Contractor's operations, and replace with new planting soil.
- E. Mow, dethatch, core aerate, and rake existing turf.
- F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
- G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.
- H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches (150 mm).
- I. Apply soil amendments and initial fertilizer required for establishing new turf and mix thoroughly into top 4 inches (100 mm) of existing soil. Install new planting soil to fill low spots and meet finish grades.
- J. Water newly planted areas and keep moist until new turf is established.

8) TURF MAINTENANCE

- A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and mulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
 - 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.

2. Apply treatments as required to keep turf and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
- B. Watering: Install and maintain irrigation to a fully functioning automated, approved system before installing turf. If irrigation is not installed before turf, contractor should provide temporary piping and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.
 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
 - C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
 1. Mow Bermuda grass to the Owner approved height. Owner to supply general maintenance materials to contractor for mowing requirements.
 - D. Turf Postfertilization: Apply fertilizer after initial mowing and when grass is dry.
- 9) SATISFACTORY TURF
- A. Turf installations shall meet the following criteria as determined by Landscape Architect:
 1. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.
 - B. Use specified materials to reestablish turf that does not comply with requirements, and continue maintenance until turf is satisfactory.
- 10) MEADOW
- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph (8 km/h).
 1. Before sowing, mix seed with seed carrier at a ratio of not less than two parts seed carrier to one part seed.
 2. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 3. Do not use wet seed or seed that is moldy or otherwise damaged.
 - B. Sow seed at a total rate of 11lb/1000 sq. ft. (142 g/92.9 sq. m).

- C. Brush seed into top 1/16 inch (1.6 mm) of soil, roll lightly, and water with fine spray.
- D. Protect seeded areas from hot, dry weather or drying winds by applying peat or compost mulch within 24 hours after completing seeding operations. Soak areas, scatter mulch uniformly to a thickness of 3/16 inch (4.8 mm), and roll surface smooth.
- E. Water newly planted areas and keep moist until meadow is established.

11) MEADOW MAINTENANCE

- A. Maintain and establish meadow by watering, weeding, mowing, trimming, replanting, and performing other operations as required to establish a healthy, viable meadow. Roll, regrade, and replant bare or eroded areas and remulch. Provide materials and installation the same as those used in the original installation.
 - 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and meadow damaged or lost in areas of subsidence.
 - 2. Apply treatments as required to keep meadow and soil free of pests and pathogens or disease. Use integrated pest management practices whenever possible to minimize the use of pesticides and reduce hazards.
- B. Watering: Refer to irrigation specifications.
 - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. If temporary irrigation system is installed, lay out system to avoid walking over muddy or newly planted areas.
 - 2. Water meadow as per vendor's written recommendations.

12) PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. No pre-emergent herbicide shall be used.
- C. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

13) CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

- B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.
- C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- D. Remove nondegradable erosion-control measures after grass establishment period.

14) MAINTENANCE SERVICE

- A. Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in "Turf Maintenance" Article. Begin maintenance immediately after each area is planted and continue until acceptable turf is established, but for not less than the following periods:
 - 1. Sodded Turf: 30 days from date of Substantial Completion.
- B. Meadow Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in "Meadow Maintenance" Article. Begin maintenance immediately after each area is planted and continue until acceptable meadow is established, but for not less than maintenance period below.
 - 1. Maintenance Period: 40 days from date of Substantial Completion.
- C. Warranty:
 - 1. Time Period: Warrant that lawns are in a healthy and flourishing condition of active growth one year from date of Final Acceptance.
 - 2. Appearance during Warranty: Lawns must be free of dead or dying patches, and areas must show foliage of a normal density, size and color.
 - 3. Delays: Delays caused by Contractor in completing planting operations which extend planting into more than one planting season will also extend Warranty Period correspondingly
 - 4. Exceptions: Contractor will not be held responsible for failures due to neglect by Owner, vandalism, or Acts of God during Warranty Period. Report such conditions in writing.

END OF SECTION 329200

PLANTS
SECTION 329300

PART 39 - GENERAL

1) RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract.

2) SUMMARY

- A. Work Included: Provide planting, complete, as shown and as specified.

- B. Section Includes:

1. Plants.
2. Tree stabilization.
3. Landscape edgings.

- C. Related Requirements:

Section 015639 "Temporary Tree and Plant Protection" for protecting, trimming, pruning, repairing, and replacing existing trees to remain that interfere with, or are affected by, execution of the Work.

1. Section 329200 "Turf and Grasses" for turf (lawn) and meadow planting, hydroseeding, and erosion-control materials.

3) DEFINITIONS

- A. Backfill: The earth used to replace or the act of replacing earth in an excavation.

- B. Balled and Burlapped Stock: Plants dug with firm, natural balls of earth in which they were grown, with a ball size not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required; wrapped with burlap, tied, rigidly supported, and drum laced with twine with the root flare visible at the surface of the ball as recommended by ANSI Z60.1.

- C. Balled and Potted Stock: Plants dug with firm, natural balls of earth in which they are grown and placed, unbroken, in a container. Ball size is not less than diameter and depth recommended by ANSI Z60.1 for type and size of plant required.

- D. Bare-Root Stock: Plants with a well-branched, fibrous-root system developed by transplanting or root pruning, with soil or growing medium removed, and with not less than the minimum root spread according to ANSI Z60.1 for type and size of plant required.
- E. Container-Grown Stock: Healthy, vigorous, well-rooted plants grown in a container, with a well-established root system reaching sides of container and maintaining a firm ball when removed from container. Container shall be rigid enough to hold ball shape and protect root mass during shipping and be sized according to ANSI Z60.1 for type and size of plant required.
- F. Fabric Bag-Grown Stock: Healthy, vigorous, well-rooted plants established and grown in-ground in a porous fabric bag with well-established root system reaching sides of fabric bag. Fabric bag size is not less than diameter, depth, and volume required by ANSI Z60.1 for type and size of plant.
- G. Finish Grade: Elevation of finished surface of planting soil.
- H. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant. Some sources classify herbicides separately from pesticides.
- I. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- J. Planting Area: Areas to be planted.
- K. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth. See Section 329115 "Soil Preparation (Performance Specification)" for drawing designations for planting soils.
- L. Plant; Plants; Plant Material: These terms refer to vegetation in general, including trees, shrubs, vines, ground covers, ornamental grasses, bulbs, corms, tubers, or herbaceous vegetation.
- M. Root Flare: Also called "trunk flare." The area at the base of the plant's stem or trunk where the stem or trunk broadens to form roots; the area of transition between the root system and the stem or trunk.
- N. Stem Girdling Roots: Roots that encircle the stems (trunks) of trees below the soil surface.
- O. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

4) REFERENCED STANDARDS

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 Standard for Nursery Stock", ANSI Z60.1
2. "Hortus III", 1976 Edition, Bailey Hortorium, Cornell University
3. American National Standards: (ANSI) Z133.1 Safety requirements for pruning, trimming, repairing, maintaining and removing trees and for cutting brush.
4. National Arborist Association (NAA): Pruning, Cabling, Bracing, Fertilization.
5. International Society of Arboriculture (ISA): Guide for Plant Appraisal, 8th Edition.

5) COORDINATION

A. Coordination with Turf Areas (Lawns): Plant trees, shrubs, and other plants after finish grades are established and before planting turf areas unless otherwise indicated.

1. When planting trees, shrubs, and other plants after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

6) PREINSTALLATION MEETINGS

1. Preinstallation Conference: Conduct teleconference meeting. Details to be determined

7) ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.
2. Plant Photographs: Include color photographs in digital or 3- by 5-inch print format of each required species and size of plant material as it will be furnished to Project. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph. For species where more than 20 plants are required, include a minimum of three photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.

3. Tree guy anchors

B. Samples for Verification: For each of the following:

1. Tree staking/guy strap

2. Organic Mulch: 1-quart (1-L) volume of each organic mulch required; in sealed plastic bags labeled with composition of materials by percentage of weight and source of mulch. Each Sample shall be typical of the lot of material to be furnished; provide an accurate representation of color, texture, and organic makeup.
3. Mineral Mulch: 2 lb (1.0 kg) of each mineral mulch required, in sealed plastic bags labeled with source of mulch. Sample shall be typical of the lot of material to be delivered and installed on-site; provide an accurate indication of color, texture, and makeup of the material.
4. Weed Control Barrier: 12 by 12 inches (300 by 300 mm).
5. Proprietary Root-Ball-Stabilization Device: One unit.
6. Edging Materials and Accessories: Manufacturer's standard size, to verify color selected.
7. Root Barrier: Width of panel by 12 inches (300 mm).
8. Galvanized wire

8) INFORMATIONAL SUBMITTALS

- A. Qualification Data: For landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of owners' contact persons.
- B. Product Certificates: For each type of manufactured product, from manufacturer, and complying with the following:
 1. Manufacturer's certified analysis of standard products.
 2. Analysis of other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
- C. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.
- D. Sample Warranty: For special warranty.

9) CLOSEOUT SUBMITTALS

- A. Maintenance Data: Recommended procedures to be established by Owner for maintenance of plants during a calendar year. Submit before expiration of required maintenance periods.

10) QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful establishment of plants.

1. Professional Membership: Installer shall be a member in good standing of either the Professional Landcare Network or the American Nursery and Landscape Association.
 2. Experience: Five years' experience in landscape installation in addition to requirements in Section 014000 "Quality Requirements."
 3. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 4. Personnel Certifications: Installer's field supervisor shall have certification in all of the following categories from the Professional Landcare Network:
 - a. Landscape Industry Certified Technician - Exterior.
 - b. Landscape Industry Certified Interior.
 - c. Landscape Industry Certified Horticultural Technician.
 5. Pesticide Applicator: State licensed, commercial.
- B. Provide quality, size, genus, species, and variety of plants indicated, complying with applicable requirements in ANSI Z60.1.
1. Selection of plants purchased under allowances is made by Landscape Architect, who tags plants at their place of growth before they are prepared for transplanting.
- C. Measurements: Measure according to ANSI Z60.1. Do not prune to obtain required sizes.
1. Trees and Shrubs: Measure with branches and trunks or canes in their normal position. Take height measurements from or near the top of the root flare for field-grown stock and container-grown stock. Measure main body of tree or shrub for height and spread; do not measure branches or roots tip to tip. Take caliper measurements 6 inches (150 mm) above the root flare for trees up to 4-inch (100-mm) caliper size, and 12 inches (300 mm) above the root flare for larger sizes.
 2. Other Plants: Measure with stems, petioles, and foliage in their normal position.
- D. Plant Material Observation: Landscape Architect may observe plant material either at place of growth or at site before planting for compliance with requirements for genus, species, variety, cultivar, size, and quality. Landscape Architect may also observe trees and shrubs further for size and condition of balls and root systems, pests, disease symptoms, injuries, and latent defects and may reject unsatisfactory or defective material at any time during progress of work. Remove rejected trees or shrubs immediately from Project site.
1. Notify Landscape Architect of sources of planting materials fourteen days in advance of delivery to site.

11) DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.
- B. Bulk Materials:
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk materials with appropriate certificates.
- C. Delivery: Do not deliver disease-infected, damaged or dried out plant materials. Plants delivered from out-of-state must be delivered in a refrigerated truck, unless approved otherwise by the landscape architect. Locally delivered trees must be covered with a nursery tarp during transport.
- D. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.
- E. Labeling: Furnish standard products in manufacturer's standard containers bearing original labels legibly showing quantity, analysis, genus/species and name of manufacturer/grower.
- F. Handling: Do not lift or handle plants by tops, stems or trunks. Handle planting stock by root ball. Do not bind or handle plants with wire or rope except wrapped rootball of field dug, material to be transplanted. Trees with broken or sandy root balls will be rejected.
- G. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.
- H. Deliver plants after preparations for planting have been completed, and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.
 - 1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
 - 2. Do not remove container-grown stock from containers before time of planting.
 - 3. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

- I. Heel in and protect with burlap B & B plant materials which cannot immediately be planted upon delivery.
- J. Anti-Desiccant: At landscape architect's option, immediately before transporting, spray deciduous plant materials in full leaf or evergreens with anti-desiccant. Apply an adequate film over trunks, branches, twigs and foliage. Contractor must spray anti-desiccant on all plant materials to be transplanted, and all evergreen trees planted in October.

12) FIELD CONDITIONS

- A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.
- B. Planting Restrictions: Plant during one of the following periods. No planting should occur in summer months. Summer months shall include June, July, August, September.
- C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

13) WARRANTY

- A. A Warrant that all trees will be healthy, in flourishing condition of active growth, and Canker-free for one year after final acceptance. Warrant that all other plants will be healthy and in flourishing condition of active growth one (1) year from date of Final Acceptance.
- B. Correct Species: Warrant that plant materials are true to species and variety for one growing seasons after installation
- C. Delays: Delays caused by Contractor in completing planting operations which extend planting into more than one planting season will extend Warranty Period correspondingly.
- D. Condition of Plants: Free of dead or dying branches and branch tips, with foliage of normal density, size and color.
- E. Replacements: As soon as weather conditions permit, replace, without cost to Owner dead plants and plants not in a vigorous, thriving condition, as determined by Landscape Architect during and at end of Warranty Period.
- F. Landscape Contractor shall be responsible for landscape maintenance through warranty period.

- G. Exclusions: Contractor will not be held responsible for failures due to neglect by Owner, vandalism and acts of God, during Warranty Period. Report such conditions in writing.

14) REPLACEMENTS

A. Failed Materials:

1. Repair and/or replace at no cost to Owner plant materials exhibiting conditions which are determined as unacceptable due to workmanship by Contractor or unacceptable since materials do not meet nursery standards specified herein.
2. Closely match replacements to adjacent specimens of same species. Apply requirements of this Specification to replacements.
3. Contractor is responsible for a maximum of two (2) replacements for each failed tree, shrub and vine, and same area of groundcover planting after final acceptance during warranty period.

B. Incorrect Materials:

1. During Warranty Period, and within 30 days of written notice, replace at no cost to Owner plants revealed as being untrue to name and species, unless substitutes have been agreed to in writing.
2. Provide replacements of a size and quality to match the planted materials at time mistake is discovered.

15) MAINTENANCE SERVICE

- A. Initial Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than 12 months from date of Substantial Completion.
- B. Initial Maintenance Service for Ground Cover and Other Plants: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than 12 months from date of Substantial Completion.

PART 40 - PRODUCTS

1) PLANT MATERIAL

- A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems

developed by transplanting or root pruning. Provide well-shaped, fully branched, healthy, vigorous stock, densely foliated when in leaf and free of disease, pests, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch (19 mm) in diameter; or with stem girdling roots are unacceptable.
 2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.
- B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.
- C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare according to ANSI Z60.1. Root flare shall be visible before planting.
- D. Labeling: Label each plant of each variety, size, and caliper with a securely attached, waterproof tag bearing legible designation of common name and full scientific name, including genus and species. Include nomenclature for hybrid, variety, or cultivar, if applicable for the plant.
- E. If formal arrangements or consecutive order of plants is indicated on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.
- F. Annuals and Biennials: Provide healthy, disease-free plants of species and variety shown or listed, with well-established root systems reaching to sides of the container to maintain a firm ball, but not with excessive root growth encircling the container. Provide only plants that are acclimated to outdoor conditions before delivery and that are in bud but not yet in bloom.
- 2) FERTILIZERS
- A. Develop a list of organic or slow-release fertilizer products for use on the project site. Submit the list to the Owner's Designated Representative for approval prior to use.
- B. Only organic fertilizers shall be used. All fertilizers shall be certified by Organic Material Review Institute (OMRI).
1. Composition: Macro and micro soil nutrients in amounts recommended in soil reports from a qualified testing agency.

- C. Chelated Iron: In amounts recommended in soil reports from a qualified testing agency. Commercial-grade FeEDDHA for dicots and woody plants, and commercial-grade FeDTPA for ornamental grasses and monocots.
- 3) MULCHES
- A. Refer to drawings and details for locations. Provide filter fabric underneath gravel mulch areas as shown in drawings
 - B. Compost Mulch: Composted pine, cedar or fir (hardwood) bark, free of sticks, dirt, dust and other debris, as accepted. Shredded bark will not be accepted. Main criteria to be dark and fine, submit sample for approval. Size: ½” average. No large pieces of bark will be accepted.
 - C. Mineral Mulch: Hard, durable stone, washed free of loam, sand, clay, and other foreign substances, of the following type, size range, and color:
 - 1. Type: Crushed or decomposed granite.
 - 2. Size Range: 3/8” maximum size; material shall include crusher fines, and small pieces up to 1/8” for a minimum of 75% composition, with the remaining 25% including material between 1/8” and 1/4”.
 - 3. Color: Deep tan/rust color to deep pink color associated with typical Texas crushed granite supply.
- 4) WEED-CONTROL BARRIERS
- A. Nonwoven Geotextile Filter Fabric: Polypropylene or polyester fabric, 3 oz./sq. yd. (101g/sq. m) minimum, composed of fibers formed into a stable network so that fibers retain their relative position. Fabric shall be inert to biological degradation and resist naturally encountered chemicals, alkalis, and acids.
- 5) PESTICIDES
- A. General: Pesticide registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
 - B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.

- C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

6) TREE-STABILIZATION MATERIALS

A. Tree Staking:

1. Stakes: Lodgepole Pine with 10 in. tapered driving point and chamfered top, green color, treated with copper naphthanate to heartwood, or metal "T" stakes, minimum 48" length, or approved equal.
2. Ties: Green canvas strap with grommets; submit sample for approval..

B. Tree Guying:

1. Ground Anchors: Duckbill-type galvanized steel ground anchor and cable assembly, by Foresight Products, Inc., (800) 325-5360 or accepted equal.

C. Galvanized Wire:

1. Thin, galvanized wire
2. 1/4" diameter, small eye screws

7) LANDSCAPE EDGINGS

- A. Steel Edging: Standard commercial-steel edging, fabricated in sections of standard lengths, with loops stamped from or welded to face of sections to receive stakes.

- 1.
2. Edging Size: **1/4 inch (6.4 mm) thick by 4 inches (100 mm) deep]**
3. Stakes: Tapered steel, a minimum of 18 inches long.
4. Accessories: Standard tapered ends, corners, and splicers.
5. Finish: Anodized.
 - a. Paint Color: Black

PART 41 - EXECUTION

1) EXAMINATION

A. Verification of Conditions:

1. Finish Grades: Finish grades for planting areas must have been established. Verify that grades are within 1 in. plus or minus of required finish grade.
2. Soil Preparation: Do not commence planting work prior to completion and acceptance of soil preparation.

3. Irrigation: Verify that irrigation system has been installed and accepted.

2) PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.
- B. Layout and Staking: Lay out plants at locations shown on Drawings and as directed by Landscape Architect in the field. Use 3 -ft. lath, color-coded for each species of plant material. Stake each tree, not specifically located by dimension or alignment. Outline shrub and groundcover beds with lime or other material. Contact Landscape Architect if discrepancies arise. Provide complete quantity of plants per area when ready to lay out and plant.
- C. Review: Locations of plants will be checked in field and will be adjusted to exact position before planting begins. Right is reserved to refuse review at this time if, in Landscape Architect's opinion, an insufficient quantity of plants is available.
- D. Digging Plant Pits: Dig tree pits and scarify sides of the tree pit after excavation - see below. Do not use an auger or tree spade.
- E. Containerized Plant pits: Excavate square plant pits as follows:
 - 1. Container Shrubs and Vines: Depth of Container + 16"
 - 2. Container Groundcover and Annuals: Depth of Container + 12"
- F. For mass plantings, excavate entire area and spread excavated material in an approved location by Owner or dispose of excavated material off-site.
- G. Ball and Burlap or Container Pot Plant Pits: Excavate square plant pits as follows:

	Width	Depth
Trees	Ball + 24 in.	Ball
Shrubs	Ball + 12 in.	Ball
Groundcover Beds	Continuous Bed in.	10" in.
Perennials	Continuous Bed	16" in.
Vines	min. 2' x 2' x 2'	2'

3) DRAINAGE TEST OF PLANTING/OBSTRUCTIONS

- A. Testing: Immediately after completion of excavation, test drainage of a representative quantity plant pits per construction site by filling with water twice in succession. Give written notification of conditions permitting retention of water in plant pits for more than twenty-four (24) hours.

- B. Correction: Submit for acceptance a written proposal and cost estimate for correction of poor drainage conditions before proceeding with planting.
 - C. Obstructions: If rock, underground construction work, tree roots or other obstructions are encountered in excavation of plant pits, acceptable alternate locations may be used at direction of Landscape Architect.
 - D. General: Prepare planting area for soil placement and mix planting soil according to **Section 329113 "Soil Preparation."**
- 4) TREE AND SHRUB PLANTING
- A. Handling and De-potting of Plant Materials:
 - 1. Damage: Avoid damage to containers and rootballs. If rootball is cracked or broken during handling and de-potting, plant will be rejected. Do not remove plant from container prior to completion of plant pit preparation.
 - 2. Plastic Containers: Tip container to horizontal orientation and shake carefully to remove shrub. Support rootball during installation to prevent cracking or shedding of soil.
 - 3. Balled and Burlapped Plants: Lift and carry by bottom of ball only. Do not remove wrapping until plant is set in plant pit. Cut wire, peel and remove wire and burlap away from upper 1/3 of rootball prior to backfilling.
 - B. Installation:
 - 1. Scarification:
 - a. Plant Rootball: After removing plant from container, scarify sides of rootball to a depth of 1 in. at four to six equally spaced locations around the perimeter of the ball. Cut and remove circling roots over 3/8 in. diameter.
 - b. Plant Pit: Scarify sides of plant pit, thoroughly breaking up surfaces and eliminating "glazed" areas.
 - 2. Positioning: Backfill plant pit to allow setting crown of tree 2 in. above new finish grade and crown of shrub 1 in. above finish grade. Thoroughly foot-tamp backfill. Position plant in planting pit, maintaining plumb condition. Maintain throughout planting operations.
 - 3. Backfilling:
 - a. Use planting mix to backfill plant pits as shown on Drawings. Brace each plant plumb and rigidly in position until planting soil as been tamped solidly around the ball and roots.
 - b. When plant pits have been backfilled approximately 2/3 full, water thoroughly and saturate rootball, before installing remainder of backfill mix to top of pit, eliminating air pockets.

4. Staking and/or Guying: When required, stake or guy as specified below.
- C. Watering: Immediately hand water plants after completion of planting operations with needle. Cover penetrated hole after watering.
- 5) TREE, SHRUB, AND VINE PLANTING
- A. Inspection: At time of planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.
- B. General:
1. Trees must be able to stand upright without support, and return to vertical after their tops have been deflected horizontally and released.
 2. Trees must remain plumb and straight from installation through warranty period.
 3. Tree support must be done as outlined herein.
- C. Staking: Stake trees under 3 ¼" caliper in accordance with the following table:
- | | |
|-----------------------------------|----------|
| Tree Caliper @ 12 in. Above-Grade | # Stakes |
| To 3" | 2 |
| 4" in. to 8 in. | 3 |
1. Locate stakes as detailed in Drawings, perpendicular to prevailing wind and as close to main trunk as is practical, avoiding root injury. Drive stakes at least 36 in. into firm ground.
 2. Remove nursery-supplied stake and tie to new stakes using two tree ties. Find proper height for point of tree ties and attach as follows:
 - a. Hold trunk in one hand, pull top to one side and release. Height at which trunk will snap back to upright position while hand-held is Base Height. Attach tree ties to trunk 6 in. above Base Height.
 - b. Secure canvas strap around tree with galvanized wire. Wire should be slack, but not tight.
- D. Guying:
1. Positioning: Guy trees at points of branching, with guys spaced equally around and outside perimeter of ball.

2. Secure canvas strap around tree with galvanized wire. Wire should be slack, but not tight.
 3. Mock-up: Install mock-up at job site per manufacturer's instructions for review and acceptance by Landscape Architect.
- 6) TREE, SHRUB, AND VINE PRUNING
- A. Remove only dead, dying, or broken branches. Do not prune for shape.
 - B. Do not apply pruning paint to wounds.
- 7) TREE STABILIZATION
- A. Trunk Stabilization by Upright Staking and Tying: Install trunk stabilization as follows unless otherwise indicated:
 1. Refer to landscape details for specific requirements.
 2. Support trees with two strands of tie wire, connected to the brass grommets of tree-tie webbing at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.
- 8) ROOT-BARRIER INSTALLATION
- A. Refer to drawings for location and details.
 - B. Align root barrier vertically, and run it linearly along and adjacent to the paving or other hardscape elements to be protected from invasive roots.
 - C. Align root barrier with bottom edge angled at 20 degrees away from the paving or other hardscape element, and run it linearly along and adjacent to the paving or other hardscape elements to be protected from invasive roots.
 - D. Install root barrier continuously for a distance of 60 inches (1500 mm) in each direction from the tree trunk, for a total distance of 10 feet (3 m) per tree. If trees are spaced closer, use a single continuous piece of root barrier.
 1. Position top of root barrier according to manufacturer's written recommendations.
 2. Overlap root barrier a minimum of 12 inches (300 mm) at joints unless system has interlocking features for joints.
 3. Do not distort or bend root barrier during construction activities.
 4. Do not install root barrier surrounding the root ball of tree.

9) GROUND COVER AND PLANT PLANTING

- A. Set out and space ground cover and plants other than trees, shrubs, and vines as indicated on Drawings in even rows with triangular spacing.
- B. Use planting soil as per section 329113 Soil Preparation.
- C. Dig holes large enough to allow spreading of roots.
- D. For rooted cutting plants supplied in flats, plant each in a manner that minimally disturbs the root system but to a depth not less than two nodes.
- E. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- F. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- G. Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

10) PLANTING AREA MULCHING

- A. Refer to drawings and details for locations. Provide filter fabric under gravel mulch as shown in drawings.
- B. Install weed-control barriers before mulching according to manufacturer's written instructions. Completely cover area to be mulched, overlapping edges a minimum of 12 inches (300mm) and secure seams with galvanized pins.
- C. Mulch backfilled surfaces of planting areas and other areas indicated.
 - 1. Trees and Treelike Shrubs in Turf Areas: Apply organic mulch ring of 3-inch average thickness, 24-inch radius around trunks or stems. Do not place mulch within 3 inches of trunks or stems.
 - 2. Organic Mulch in Planting Areas: Apply 3-inch average thickness of organic mulch extending 12 inches beyond edge of individual planting pit or trench and over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches of trunks or stems.
 - 3. Mineral Mulch in Planting Areas: Apply 3-inch average thickness of mineral mulch over whole surface of planting area, and finish level with adjacent finish grades. Do not place mulch within 3 inches of trunks or stems.

11) EDGING INSTALLATION

- A. Steel Edging: Install steel edging where indicated according to manufacturer's written instructions. Anchor with steel stakes spaced approximately 30 inches (760 mm) apart, driven below top elevation of edging or otherwise noted in drawings and details.

12) PLANT MAINTENANCE

- A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.
- B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.
- C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices when possible to minimize use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

13) PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents according to authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Pre-Emergent Herbicides (Selective and Nonselective): Apply to shrub, areas according to manufacturer's written recommendations. Do not apply to seeded areas.
- C. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

14) CLEANING AND PROTECTION

- A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.
- C. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.
- D. After installation and before Substantial Completion, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

- E. At time of Substantial Completion, verify that tree-watering devices are in good working order and leave them in place. Replace improperly functioning devices.

15) MAINTENANCE SERVICE

- A. Maintenance Service for Trees and Shrubs: Provide maintenance by skilled employees of landscape Installer. Maintain as required in "Plant Maintenance" Article. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:

- 1. Maintenance Period: Six months from date of Substantial Completion.

- B. Maintenance Service for Ground Cover and Other Plants: Provide maintenance by skilled employees of landscape Installer. Maintain as required in "Plant Maintenance" Article. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established, but for not less than maintenance period below:

- 1. Maintenance Period: Six months from date of Substantial Completion.

16) TERMINATION OF MAINTENANCE PERIOD

- A. Final Acceptance Procedure:

- 1. Work will be accepted by Landscape Architect upon satisfactory completion of work, including maintenance period, but exclusive of replacement of materials under Warranty Period.
 - 2. Submit a written request to Landscape Architect for review for Final Acceptance at least five (5) working days prior to anticipated Final Review date, which is at the end of Maintenance Period.

- B. Corrective Work:

- 1. Work requiring corrective action or replacement must be performed within ten (10) calendar days after Final Review.
 - 2. Perform corrective work and materials replacement in accordance with Drawings and Specifications, and will be made by Contractor at no cost to Owner.
 - 3. After corrective work is completed, the Contractor will again request a Final Review for Final Acceptance as outlined above.
 - 4. Continue maintenance of landscaped areas until such time as corrective measures have been completed and accepted.

- C. Conditions for Acceptance of Work at End of Maintenance Period:

- 1. Each plant must be alive and thriving, showing signs of growth and no signs of stress, disease, or any other weaknesses.
 - 2. Replace plants not meeting these conditions. An additional Warranty Period equal in length to the original will be commenced for such plants and planted areas.

- D. Final Acceptance Date: The date on which Landscape Architect issues a Letter of Final Acceptance. Upon Final Acceptance, Owner will assume responsibility for maintenance of work.

17) CLOSEOUT

- A. Landscape Maintenance Record: Submit binder to Owner with documentation and records required and utilized during maintenance period.

END OF SECTION 329300

RECTANGULAR RAPID FLASHING BEACONS (RRFB) SOLAR POWERED WITH BREAKAWAY TRANSFORMER BASE

1.0 DESCRIPTION

This work shall consist of furnishing and installing solar powered rectangular rapid flashing beacons (RRFB), at the locations indicated in the contract documents or where directed by the Engineer. All work shall be in accordance with the Standard Specifications and as shown in the contract documents.

2.0 GENERAL REQUIREMENTS

- 2.1 Each RRFB shall consist of two rapidly and alternately flashing rectangular yellow indications having LED array based pulsing light sources, and shall be designed, located, and operated with the detailed requirements specified on the plans.
- 2.2 Each RRFB shall be a complete assembly, consisting of supporting structure (pole, breakaway transformer base, sign supports), indications, signage, and electrical components (wiring, solid-state circuit boards, etc).

3.0 FUNCTIONAL REQUIREMENTS

- 3.1 Each RRFB shall require solar power (battery back-up power available).
- 3.2 Each RRFB shall be activated by push button.
- 3.3 Each RRFB shall be ADA compliant.
- 3.4 The RRFB shall be normally dark, shall initiate operation only upon pedestrian actuation, and shall cease operation after a predetermined time limit (based on MUTCD procedures).
- 3.5 A small light directed at, and visible to, pedestrians in the crosswalk shall be installed integral to the RRFB to give confirmation that the RRFB is in operation.
- 3.6 When activated, the RRFB indications shall flash in a rapidly alternating “wigwag” flashing sequence (left light on, then right light on).
- 3.7 Each of the RRFB’s indications shall have 70 to 80 periods of flashing per minute.
- 3.8 When activated, all indications associated with a given crosswalk (including those with an advance crossing sign, if used) shall simultaneously commence operation of their alternating rapid flashing within 150msec, and shall cease operation at a predetermined time after the pedestrian actuation.

- 3.9 The RRFB shall have a side emitting pedestrian confirmation light and shall be directed at and visible to pedestrians in the crosswalk, and it shall flash concurrently with the vehicle indications to give confirmation that the Rapid Rectangular Flashing Beacon is in operation.

4.0 MECHANICAL CONSTRUCTION REQUIREMENTS

- 4.1 Each RRFB indication shall be a minimum size of approximately 5" wide x 2" high.
- 4.2 The two RRFB indications shall be aligned horizontally, with the longer dimension of the indication horizontal, and a minimum space between the two indications of approximately 7" measured from inside edge of one indication to inside edge of second indication.
- 4.3 The outside edges of the two indications, including any housing, shall not protrude beyond the outside edges of the integral signage of the RRFB.
- 4.4 The light intensity of the RRFB's indications shall meet the minimum specifications of the Society of Automotive Engineers (SAE) standard 1595 (Directional Flashing Optical Warning Devices for Authorized Emergency, Maintenance, and Service Vehicles) dated January 2005.
- 4.5 The supporting structure of the RRFB (breakaway transformer base, post, sign holders, etc) shall be constructed of manufactured aluminum embodiments and powder coated.
- 4.6 Each RRFB to be supplied with all required hardware to install assembly.
- 4.7 The light bar housing shall be constructed of durable, corrosion resistant powder coated aluminum with stainless steel fasteners.
- 4.8 All mounting hardware required for mounting the light bar housing shall be provided and shall be stainless steel.
- 4.9 The LEDs used shall be rated for a minimum 15-year life span.
- 4.10 The controller shall be housed in a NEMA 3R rated aluminum enclosure, intended for outdoor use, primarily to provide a degree of protection against corrosion, windblown dust and rain, splashing water, hose-directed water, and damage from ice formation.
- 4.11 The flashing output shall have 70 to 80 periods of flashing per minute and shall be in compliance with the requirements of the MUTCD.

- 4.12 The controller shall be capable of storing input count data in preset intervals, with downloadable capabilities using optional Windows Based PC software program and standard RS232 or USB cable
- 4.13 The controller shall be replaceable independently of other components.
- 4.14 The battery shall be a 12VDC Absorbed Glass Mat (AGM) sealed lead-acid, maintenance free battery.
- 4.15 The battery shall be replaceable independently of other components.
- 4.16 Radio control shall be solar-powered; operating on a FCC approved 900 MHz frequency, hopping spread spectrum network with a normal operating range of 1000 feet.
- 4.17 Radios shall provide wireless communication between the assemblies to integrate the pushbutton activation of indications.
- 4.18 To ensure all integral indications consistently flash in unison, the radio shall synchronize the controllers to activate the indications within 120msec of one other
ITEM 680.82220310 – RECTANGULAR RAPID FLASHING BEACONS (RRFB)
SOLAR POWERED WITH BREAKAWAY TRANSFORMER BASE Page 3 of 4
04/24/17 and remain synchronized throughout the duration of the flashing cycle.
- 4.19 Radio systems shall operate from 3.6VDC to 15VDC.
- 4.20 The radio shall be replaceable independently of other components.
- 4.21 The solar panel shall be affixed to an aluminum plate and bracket, adjustable at an angle of 45° - 60° to facilitate adjustment for maximum solar collection and optimal battery strength.
- 4.22 The solar panel assembly (panel, plate and bracket) shall be mounted on a 360° rotatable pole cap mount, to facilitate adjustment for maximum solar collection and optimal battery strength.
- 4.23 All signs shall conform to MUTCD standards.
- 4.24 All sign blanks and plaques shall be per TXDOT 'Signs' specification item 636.
- 4.25 Sign sheeting shall be per TxDOT 'Signs' specification item 636.
- 4.26 All sign assemblies shall use provided anti-vandal fasteners and tools to mount components to sign and sign to fixture.

- 4.27 Crossings signs shall be W11-2 (Person Walking) and W16-7p (Downward Pointing Arrow) MUTCD.
- 4.28 Pedestrian pushbutton instruction signs shall be furnished, at a minimum size of 9 inches x 12 inches, to be mounted adjacent to or integral with each pedestrian pushbutton.
- 4.29 A piezo pushbutton shall be ADA compliant, and shall operate as normally open (n/o) circuit.
- 4.30 The light intensity of the RRFB's indications shall meet the minimum specifications of the Society of Automotive Engineers (SAE) standard 1595 (Directional Flashing Optical Warning Devices for Authorized Emergency, Maintenance, and Service Vehicles) dated January 2005.
- 4.31 Each RRFB shall be located between the bottom of the crossing warning sign and the top of the supplemental downward diagonal arrow plaque.

5.0 ENVIROMENTAL OPERATIONS

- 5.1 The pushbutton shall be capable of continuous operation over a temperature range of -30 degrees F to 165 degrees F (-34 degrees C to 74 degrees C).
- 5.2 Autonomy with a fully charged battery shall be up to 21 days without sun at an ambient temperature of 70°F with ten (10) actuations per hour.
- 5.3 The battery shall have a minimum operating temperature range of -30°F to 160°F.
- 5.4 The radio shall have a minimum operating temperature range of -30°F to 160°F.
- 5.5 The solar panel shall provide sufficient energy to operate the system 24 hrs/day, 365 days/year at the ambient temperature of 70°F with ten (10) actuations per hour. RRFB to be rated for 90 mph wind conditions.
- 5.6 The solar panel shall have a minimum operating temperature of -30°F to 160°F.

6.0 METHOD OF MEASUREMENT

- 6.1 This work shall be measured as the number of RRFBs furnished and installed in accordance with the Contract Documents, or as directed by the Engineer.

7.0 BASIS OF PAYMENT

- 7.1 The unit price of each RRFB shall include the cost of all labor, material, and equipment necessary to complete the work.

END OF SECTION

SS-180

Division 16 Electrical

16010 Electrical General Provisions

16110 Raceways

16120 Wire and Cable

16199 Miscellaneous

16410 Underground Electrical

16450 Grounding Systems

16500 Lighting

SECTION 16010

ELECTRICAL GENERAL PROVISIONS

PART 1 - GENERAL

1.01 GENERAL CONDITIONS

- A. The General Conditions and Requirements, Special Provisions, are hereby made a part of this Section.
- B. The Electrical Drawings and Specifications under this Section shall be made a part of the Contract Documents. The Drawings and Specifications of other sections of this contract, as well as supplements issued thereto, information to bidders and pertinent documents issued by the Owner's Representative are a part of these Drawings and Specifications and shall be complied with in every respect. All the above documents will be on file at the office of the Owner's representative and shall be examined by all the bidders. Failure to examine all documents shall not relieve the responsibility or be used as a basis for additional compensation.
- C. Furnish all work, labor, tools, superintendence, material, equipment and operations necessary to provide for a complete and workable electrical system as defined by the Contract Documents. A licensed journeyman shall be on site at all times while electrical work is being performed and a licensed master electrician shall be in charge of the work. Submit license for master electrician and all journeymen.
- D. It is the intent of the Contract Documents that upon completion of the electrical work, the entire system shall be in a finished, workable condition.
- E. All work that may be called for in the Specifications but not shown on the Drawings, or, all work that may be shown on the Drawings but not called for in the Specifications, shall be performed by the Contractor as if described in both. Should work be required which is not set forth in either document, but which work is nevertheless required for fulfilling of the intent thereof, then the Contractor shall perform all work as fully as if it were specifically set forth in the Contract Documents. All SCADA work on HMI must be done in the presence of a district SCADA staff member.
- F. The definition of terms used throughout the Contract Documents shall be as specified by the following agencies:
 - 1. Underwriters Laboratories
 - 2. National Electrical Manufacturers Association
 - 3. American National Standards Institute
 - 4. Insulated Power Cable Engineers Association
 - 5. National Electrical Code
 - 6. National Fire Protection Association

- G. The use of the terms "as (or where) indicated", "as (or where) shown", "as (or where) specified", or "as (or where) scheduled" shall be taken to mean that the reference is made to the Contract Documents, either on the Drawings or in the Specifications, or both documents.
- H. The use of the words "furnish", "provide", or "install" shall be taken to mean that the item or facility is to be both furnished and installed under Division 16, unless stated to the contrary that the item or facility is to be either furnished under another Division or under another Contract, furnished under this Division and installed under another Division or under another Contract, or furnished and installed under another Division or under another Contract.

1.02 PERMITS AND CODES

- A. Secure all permits, licenses, and inspection as required by all authorities having jurisdiction. Give all notices and comply with all laws, ordinances, rules, regulations and contract requirements bearing on the work.
- B. The minimum requirements of the electrical system installation shall conform to the latest edition of the National Electrical Code, as well as state and local codes.
- C. Codes and ordinances having jurisdiction and specified codes shall serve as minimum requirements, but, if the Contract Documents indicate requirements which are in excess of those minimum requirements, then the requirements of the Contract Documents shall be followed. Should there be any conflicts between the Contract Documents and codes, or any ordinances, report these with bid.

PART 2 - PRODUCTS

2.01 STANDARDS

- A. All materials and equipment shall conform to the requirements of the Contract Documents. They shall be new, free from defects, and they shall conform to the following standards where these organizations have set standards:
1. Underwriters Laboratories (UL)
 2. National Electrical Manufacturer's Association (NEMA)
 3. American National Standards Association (ANSI)
 4. Insulated Cable Engineers Association (ICEA)
- B. All material and equipment of the same class shall be supplied by the same manufacturer, unless specified to the contrary.
- C. All products shall bear UL labels where standards have been set for listing. All other products shall be UL labeled. Motor control centers, switchboards, and switchgear shall

have UL labels. Custom panels, modified motor starters, control panels, and instrument panels and the like shall be manufactured by a fabricator approved as a UL508A shop and shall bear a UL 508A or UL Industrial Control Panel label.

- D. When the Contractor provides a product for this project he shall be bound by the terms and conditions of the Contract Documents and he shall agree to warrant and to be liable for the merchantability and fitness of his product to the applications to which his product is applied under the Contract Documents.

2.02 SHOP DRAWINGS AND SUBMITTALS

- A. Shop drawings and submittals shall comply with general conditions and as specified herein.
- B. Shop drawings shall be taken to mean detailed drawings with dimensions, schedules, weights, capacities, installation details and pertinent information that will be needed to describe the material or equipment in detail.
- C. Submittals shall be taken to mean catalog cuts, general descriptive information, catalog numbers and manufacturer's name.
- D. Submit for review all shop drawings and submittals as hereinbefore called for.
- E. Review of submittals or shop drawings shall not remove the responsibility for furnishing materials or equipment or proper dimensions, quantity and quality, nor will such review remove the responsibility for error in the shop drawings or submittals.
- F. Failure to process submittals or shop drawings on any item and/or items specified shall make the Contractor responsible for the suitability for the item and/or items, even though the item and/or items installed appear to comply with the Contract Documents.
- G. Assume all costs and liabilities which may result from the ordering of any material or equipment prior to the review of the shop drawings or submittals, and no work shall be done until the shop drawings or submittals have been reviewed. In case of correction or rejection, resubmit until such time as they are accepted by the Owner's Representative, and such procedures will not be cause for delay.
- H. Submittals and shop drawings shall be compiled from the manufacturer's latest product data. Should there be any conflicts between this data and the Contract Documents, report this information for each submittal and/or shop drawing.
- I. Shop drawings and submittals will be returned and unchecked if the specific items proposed are not clearly marked, or if the General Contractor's approval stamp is omitted.
- J. When requested, furnish samples of materials for acceptance review. If a sample has been reviewed and accepted, then that item of material or equipment installed on the job shall be

equal to the sample; if it is found that the installed item is not equal, then replace all such items with the accepted sample equivalent.

2.03 ACCEPTANCE AND SUBSTITUTIONS

- A. All manufacturers named are a basis as a standard of quality and substitutions of any equal product will be considered for acceptance. The judgement of equality of product substitution shall be made by the Engineer.
- B. Substitutions prior to bidding are not allowed. Substitutions after award of Contract shall comply with the general conditions. Furnish all required supporting data. The submittal of substitutions for review shall not be cause for time extensions.
- C. Where substitutions are offered, the substituted product shall meet the product performance as set forth in the specified manufacturer's current catalog literature, as well as meeting the details of the Contract Documents.
- D. The details on the drawings and the requirements of the Specifications are based on the first listed material or equipment. If any other than the first listed material or equipment is furnished, then assume responsibility for the correct function, operation, and accommodation of the substituted item. In the event of misfits or changes in work required, either in this section or other sections of the Contract, or in both, bear all costs in connection with all changes arising out of the use of other than the first listed item specified.
- E. Substitutions of products under other sections may occur. Make necessary adjustments and additions to work under Division 16 to accommodate those substitutions. Such adjustments and additions shall be performed in compliance with Division 16 Specifications at no additional charge.
- F. Energy efficiency of each item of power consuming equipment shall be considered one of the standards for evaluation.

PART 3 – EXECUTION

3.01 CUTTING AND PATCHING

- A. Cutting and patching required under this section shall be done in a neat workmanlike manner. Cutting lines shall be uniform and smooth.
- B. Use concrete saws for large cuts in concrete and use core drills for small round cuts in concrete.
- C. Where openings are cut through masonry walls, provide lintel or other structural support to protect the remaining masonry. Adequate support shall be provided during the cutting operation to prevent damage to masonry.

- D. Where large openings are cut through metal surfaces, attach metal angle around the opening.
- E. Patch concrete openings that are to be filled with nonshrinking cementing compound. Finish concrete patching shall be troweled smooth and shall be uniform with surrounding surfaces.

3.02 WATERPROOFING

Provide waterproof flashing for each penetration of exterior walls and roofs.

3.03 CONSTRUCTION REQUIREMENTS

- A. Except where specifically noted or shown, the locations and elevations of equipment are approximate and are subject to small revisions as may prove necessary or desirable at the time the work is installed. Locations changed substantially from that shown on the drawings shall be confirmed with the Engineer in advance of construction.
- B. Where equipment is being furnished under another Division, request from Engineer an accepted drawing that will show exact dimensions of required locations or connections. Install the required facilities to the exact requirements of the accepted drawings.
- C. All work shall be done in the best and most workmanlike manner by qualified, careful electricians who are skilled in their trade. The standards of work required throughout shall be of the first class only.
- D. Unless shown in detail, the Drawings are diagrammatic and do not necessarily give exact details as to elevations and routing of raceways, nor do they show all offsets and fittings; nevertheless, install the raceway system to conform to the structural and mechanical conditions of the construction.
- E. Holes for raceway penetration into sheet metal cabinets and boxes shall be accurately made with an approved tool. Cutting openings with a torch or other device that produces a jagged, rough cut will not be acceptable.
- F. Cabling inside equipment shall be carefully routed, trained and laced. Cables so placed that they obstruct equipment devices will not be acceptable.
- G. Equipment shall be set level and plumb. Supporting devices installed shall be set and so braced that equipment is held in a rigid, tight-fitting manner.

3.04 EQUIPMENT PROTECTION

- A. Provide suitable protection for all equipment, work and property against damage during construction.

- B. Assume full responsibility for material and equipment stored at the site.
- C. Conduit openings shall be closed with caps or plugs during installation and made watertight. All outlet boxes and cabinets shall be kept free of concrete, plaster, dirt and debris.
- D. Equipment shall be covered and tightly sealed against entrance of dust, dirt and moisture.
- E. All dry-type transformers prior to energization shall be protected against moisture and dirt absorption by a suitable covering. Also, maintain heat inside the covering by means of 100 watt minimum lamps.
- F. Interiors of and motor control centers shall be kept clean and dry prior to energization. Maintain heat inside each unit with one (1) 100 watt lamp located at bottom of each vertical section or energize section space heaters.

3.05 COOPERATION WITH WORK UNDER OTHER DIVISIONS

- A. Cooperate with all other trades so as to facilitate the general progress of their work. Allow all other trades every reasonable opportunity for the installation of their work and the storage of their materials.
- B. The work under this section shall follow the general building construction closely. Set all pipe sleeves, inserts, etc., and see that openings for chases, pipes, etc., are provided before concrete is placed or masonry installed.
- C. Work with other trades in determining exact locations of outlets, conduits, fixtures, and pieces of equipment to avoid interference with lines as required to maintain proper installation of other work.
- D. Make such progress in work that will not delay the work of other trades. Schedule the work so that completion dates as established by the Engineer are met. Furnish sufficient labor or work overtime to accomplish these requirements if directed to do so.

3.06 INSTALLATION OF WORK UNDER ANOTHER DIVISION

- A. Verify the electrical capacities of all motors and electrical equipment furnished under other sections, or furnished by the Owner, and request wiring information from the Engineer if wiring requirements are different from that specified under this Section. Do not make rough-ins until equipment verification has been received.
- B. Install all motors, controllers, terminal boxes, pilot devices, and miscellaneous items of electrical equipment that are not integrally mounted with the equipment furnished under other divisions. All such equipment shall be securely mounted and adequately supported in a neat and workmanlike manner.

3.07 NOT USED

3.08 CLEAN-UP

- A. Remove all temporary labels, dirt, paint, grease and stains from all exposed equipment. Upon completion of work, clean equipment and the entire installation so as to present a first class job suitable for occupancy. No loose parts or scraps of equipment shall be left on the premises.
- B. Equipment paint scars shall be repaired with paint kits supplied by the equipment manufacturer or with an approved paint.
- C. Clean interiors of each item of electrical equipment. At completion of work all equipment interiors shall be free from dust, dirt and debris.

3.09 TESTS

- A. Test all systems furnished under Division 16 and repair or replace all defective work. Make all necessary adjustments to the systems and instruct the Owner's personnel in the proper operation of the system.
- B. Make all circuit breaker and protective relay adjustments and settings.
- C. Make the following minimum tests and checks prior to energizing the electrical equipment:
 - 1. Check all wire and cable terminations for tightness.
 - 2. Test all wiring as specified in Section 16120.
 - 3. Test grounding system as specified in Section 16410.
 - 4. Set all transformer taps as required to obtain the proper secondary voltage.
 - 5. Carefully check all interlocking, control and instrument wiring for each system to ascertain that the system will function properly as indicated by schematics, wiring diagrams, or as specified herein.
 - 6. Mechanical inspection of all low voltage circuit breakers, disconnect switches, motor starters, control equipment, etc. for proper operation.
 - 7. Provide all instruments and equipment required for the above tests.

3.11 RECORD DRAWINGS

- A. At the start and during the progress of the job, keep one separate set of blue-line prints for making construction notes and mark-ups.
- B. Show conduit routing and wiring runs as constructed and identify each.
- C. Record all deviations from the Contract Documents.
- D. Submit set of marked-up drawings for review. The final payment will not be made until

the review is complete.

3.12 OPERATIONS AND MAINTENANCE MANUALS

- A. Six (6) weeks prior to the completion of the project, compile an Operations and Maintenance Manual on each item of equipment. These manuals shall include detailed instructions and maintenance as well as spare parts lists.
- B. Submit copies for review as hereinbefore specified.
- C. Preliminary Operations and Maintenance Manuals shall be included with the initial shipments.

END OF SECTION

SECTION 16110

RACEWAYS

PART 1 – GENERAL

1.01 SCOPE

- A. This section shall include raceways, enclosures, supporting devices ancillary fittings and appurtenances. Furnish and install the complete raceway systems as shown on the Drawings and as specified herein.
- B. Raceway is a broad-scope term that shall be defined by the National Electrical Code under Article 100.

1.02 APPLICATIONS

- A. Except as otherwise shown on the Drawings, or otherwise specified, all underground and in-slab conduit raceways shall be of the following type:
 - 1. Except as otherwise specified, all power and control underground conduit runs shall be made with schedule 40 PVC. Bends to grade shall be made with plastic coated rigid aluminum conduit.
- B. Except as otherwise shown on the Drawings, or otherwise specified, all above grade conduit raceways shall be of the following type:
 - 1. Outdoor exposed power and control conduit shall be rigid aluminum conduit.

1.03 SUBMITTALS AND SHOP DRAWINGS

- A. Process catalog submittals for the following:
 - 1. Rigid Metallic Aluminum Conduit
 - 2. Plastic Jacketed Rigid Aluminum Conduit
 - 3. Rigid Non-Metallic Conduit
 - 4. Conduit Bushings
 - 5. Tape Products
 - 6. Wiring Devices
 - 7. Supporting Devices
 - 8. Labels
 - 9. Grounding Devices

PART 2 – PRODUCTS

2.01 RACEWAYS

- A. Rigid metallic aluminum conduit shall be manufactured of 6063 alloy, T-1 temper, with no more than 0.02% copper content. All conduit couplings shall be threaded aluminum. All such conduit shall be listed with UL and comply with UL-6 and ANSI C80.5. Aluminum conduit shall be New Jersey Aluminum, or equal.
- B. Plastic coated rigid aluminum conduit shall consist of rigid aluminum body that complies with above specifications for rigid aluminum conduit, plus conduit shall have 40 mil thick heat-fused PVC over outside and 2 mil coat of fully catalyzed phenolic inside. The inside coat shall have the chemical resistance of the outer coating and shall not dissolve in lacquer thinner. All couplings shall be equipped with PVC sleeves that extend one pipe diameter or 2", whichever is less, beyond the end of the coupling. All plastic coated conduit shall conform to NEMA Standard #RNI-1974 (Type A) and such conduit shall be manufactured by Robroy, Perma-Cote, or Kor-Kap.
- C. Non-metallic rigid conduit shall be Schedule 40 PVC. Such conduit shall be UL listed for 90 degrees C and shall conform to NEMA TC-2 and UL-651 standards. Furnish Carlon, Sedco, or equal. Furnish manufacturer's approved solvent for joining couplings.
- D. Conduit for fiber optic cable shall be continuous smooth wall HPDE in 1-1/4" size and shall have an SDR rating of 9. Two shall be run in each ductbank. One shall be blue in color and one shall be orange in color. Provide pull rope for installation of fiber optic cable by others. Fiber Optic conduit shall be Chapman Electric Supply, Inc. (800-767-1576) or approved equal.

2.02 CONDUIT FITTINGS

- A. Conduit Hubs for rigid metallic conduit shall be constructed of aluminum. Furnish Meyers Hubs.
- B. Conduit field-applied hubs for sheet metal enclosures shall be aluminum body with recessed neoprene sealing ring, threaded NPT insert, and shall be, T&B 370 AL series, or equal products by OZ/Gedney.
- C. Conduit hubs for non-metallic enclosures shall be fiberglass polyester reinforced with galvanized steel core, complete with locknut and grounding bushing. All such hubs shall be Crouse-Hinds Type NHU, or equal.
- D. Rigid metallic conduit chase nipples, split couplings, slip fittings, unions, reducers, and enlargers, shall be aluminum.
- E. Rigid metallic conduit grounding bushings shall be aluminum body with threaded hub, bakelite insulated throat, and tin-plated copper ground lug. Furnish OZ/Gedney type

ABLG, or equal.

2.03 CONDUIT BODIES AND BOXES

- A. Conduit bodies such as "C", "LB", "T" and the like pulling fittings shall be aluminum. Covers for damp and/or wet location use shall be gasketed cast metal with "wedge-nut" clamps. Covers for dry locations shall be cast aluminum and hardware shall be 316 stainless steel. All covers shall be equipped with clamp type clevises. Furnish Crouse-Hinds Form 7, or Appleton Form "FM7" products.
- B. Conduit bodies for use in corrosive areas shall be as specified above but shall have 40 mil plastic coated PVC jacket and 2 mil interior coating as specified for plastic coated rigid metallic conduit. Furnish Robroy, Perma-Cote, or Kor-Kap
- C. Conduit bodies such as "GUA", "GUAT", "GUAL", and the like pulling/splicing fittings shall be cast aluminum with threaded cast aluminum covers. All such conduit bodies shall be Killark "GE" series, or equal products by Crouse-Hinds or Appleton.
- D. Outlet boxes, pullboxes, and junction boxes whose volume is smaller than 100 cubic inches shall be sand-cast, copper-free aluminum. All boxes shall have threaded hubs and integral cast mounting lugs. Furnish Crouse-Hinds "FD" style condulets, Appleton "FD" style Unilets, or equal.
- E. Covers for cast metal boxes shall be gasketed cast metal covers with 316 stainless steel screws and shall be suitable for use in wet or damp locations.
- F. Conduit and device boxes for use in concealed drywall applications only shall be pressed sheet steel type. Furnish Raco or equal.

2.05 LABELS

- A. Buried conduit marking tape for marking path of secondary buried conduits shall be four (4") inch nominal width strip of polyethylene with highly visible, repetitive marking "BURIED CONDUIT" or similar language, repeated along its length.
- B. Voltage warning labels for cabinets shall be waterproof vinyl strips with adhesive back and shall have "DANGER (VOLTAGE) - DISCONNECT ALL SOURCES OF POWER BEFORE ENTERING". Letters shall be highly visible red color on white background.
- C. Specify stainless steel or non-metallic machine printed conduit tags attached with stainless steel wire or nylon tie wraps.

2.06 SUPPORTING DEVICES

- A. Mounting hardware, nuts, bolts, lockwashers, and washers, shall be Grade 316 stainless steel.

- B. Unless otherwise indicated, channel framing and supporting devices shall be manufactured of ASTM 6063, T6 grade aluminum; 1-5/8" wide x 3-1/4" deep (double opening type). Thickness shall be 0.105". Clamp nuts for use with channels shall be grade 316 stainless steel.
- C. Where indicated, furnish grade 316 stainless steel slotted channel members 1-5/8" wide x 1-5/8" deep or 1 5/8" x 3 1/4" deep, double-faced type, 12 gauge. All hardware and conduit clamps shall be grade 316 stainless steel.
- D. Conduit clamp supports for terminating conduits onto cable trays shall be mechanically galvanized 316 SS or aluminum with adjustable angle clamp. Fittings shall be provided with 316 stainless steel hardware. Furnish OZ/Gedney type CTC products.
- E. All such channel members and fittings shall be B-Line, Unistrut or equal.
- F. Conduit straps, and associated nuts, lockwashers and bolts for use with channels shall be 316 stainless steel with 316 stainless steel hardware. Furnish B-Line products or equal.
- G. After-set concrete inserts (drilled expansion shields "D.E.S.") shall consist of two types. For anchors to accommodate 5/16" diameter bolts and smaller, provide HILTI "HDI" series 316 stainless steel anchors. For anchors to accommodate 3/8" diameter and larger bolts, provide HILTI "HVA" series with 316 stainless steel threaded inserts.
- H. Nest-back or clamp-back conduit supports shall be two-piece type constructed of copper free aluminum. Furnish Thomas & Betts 1976AL Series, or equal.
- I. Conduit beam clamps shall be stainless steel or hardened aluminum and shall be as follows:

<u>TYPE</u>	<u>MANUFACTURER</u>
1. Right Angle	OZ/Gedney Type "UBCG", or equal.
2. Parallel	OZ/Gedney Type "UPCG", or equal.
3. Edge	OZ/Gedney Type "UECG", or equal.

- J. Conduit "U" bolts shall be 316 stainless steel with 316 stainless steel hex-head bolts.
- K. Equipment stands for supporting devices such as control stations, device boxes and the like, shall consist of a welded structural aluminum c-channel and plate aluminum floor plate as detailed on the drawings.

2.07 MISCELLANEOUS MATERIAL

- A. Double bushings for insulating wiring through sheet metal panels shall consist of mating male and female threaded phenolic bushings. Phenolic insulation shall be high-impact

thermosetting plastic rated 150 degrees C. Furnish OZ Type "ABB", or equal.

- B. Conduit pull-cords for use in empty raceways shall be glass-fiber reinforced tape with foot-marked identification along its length. Furnish Thomas, Greenlee, or equal products.
- C. Conduit thread coating compound shall be conductive, non-galling, and corrosion inhibiting. Furnish Crouse- Hinds Type "STL", Appleton Type "ST", or equal.
- D. Plastic compound for field-coating of ferrous material products shall be PVC in liquid form that sets-up semi- hard upon curing. Furnish Rob Roy "Rob Kote", Sedco "Patch Coat", or equal.
- E. Foam sealant for waterproofing uses shall be Chase Technologies "Chase Foam", or equal.

PART 3 – EXECUTION

3.01 RACEWAYS

- A. Install the conduit system to provide the facility with the utmost degree of reliability and maintenance free operation. The conduit system shall have the appearance of having been installed by competent workmen. Kinked conduit, conduit inadequately supported or carelessly installed, do not give such reliability and maintenance free operation and will not be accepted.
 - 1. Parallel runs of conduit shall be parallel to each other throughout the entire run. Bends and offsets shall occur at the same point such that all offset angles are the same.
 - 2. Conduits making vertical or horizontal changes in direction such that concentric bends are required are acceptable. All concentric bends shall have radii with the same center point.
 - 3. Conduit installation shall be planned such that conduits crossing each other will be minimized.
 - 4. Conduit installations not meeting these criteria in the sole judgment of the Owner or Engineer shall be removed and reinstalled at no charge in the contract price or schedule.
 - 5. Conduits having conductors installed shall not be a reason to not remove and reinstall unacceptable conduit installations. The installed conductors shall be removed and replaced if present in unacceptable conduit systems.
- B. Raceways shall be installed for all wiring runs, except as otherwise indicated.

- C. Conduit sizes, where not indicated, shall be N.E.C. code-sized to accommodate the number and diameter of wires to be pulled into the conduit. Unless otherwise indicated, 3/4" trade-size shall be minimum size conduit.
- D. Unless otherwise noted, conduit runs shall be installed exposed. Such runs shall be made parallel to the lines of the structure. Conduit shall be installed such that it does not create a tripping hazard or an obstruction for headroom.
- E. All runs of rigid conduit shall be threaded, and all male threads shall be coated with nongelling thread compound prior to assembly.
- F. Conduit runs made in concrete pours or surface-mounted runs that are attached to the structure, shall be equipped with an expansion/deflection fitting where they cross an expansion joint, or at every 100 feet.
- G. Rigid metallic conduit runs shall have their couplings and connections made with screwed fittings and shall be made up wrench-tight. Check all threaded conduit joints prior to wire pull. Coat all male threads with Crouse-Hinds "STL" or equal, conductive lubricant prior to joining.
- H. All conduit runs shall be watertight over their lengths of run, except where drain fittings are indicated. In which cases, install specified drain fittings.
- I. Empty conduits shall have pull-ropes installed. Identify each terminus as to location of other end and trade size of conduit. Use blank plastic waterproof write-on label and write information on each label with waterproof ink. Pull a mandrel through each conduit to check and clear blockage before installing pull-rope. Owner's representative shall witness test. Provide documentation that all conduits are clear and ready for future use. Cap exposed ends of empty conduit with threaded plugs.
- J. Conduit runs into boxes, cabinets and enclosures shall be set in a neat manner. Vertical runs shall be set plumb. Conduits set cocked or out of plumb will not be acceptable.
- K. Conduit entrances into equipment shall be carefully planned. Cutting away of enclosure structure, torching out sill or braces, and removal of enclosure structural members, will not be acceptable. No top entry into NEMA 4X where installed outdoors.
- L. Use approved hole cutting tools for entrances into sheet metal enclosure. Use of cutting torch or incorrect tools will not be acceptable. Holes shall be cleanly cut and they shall be free from burrs, jagged edges, and torn metal.
- M. All raceways shall be swabbed clean after installation. There shall be no debris left inside. All interior surfaces shall be smooth and free from burrs and defects that would injure wire insulation.

3.02 CONDUIT BODIES AND BOXES

- A. Conduit bodies such as "LB", "T", "GUAT", etc., shall be installed in exposed runs of conduit wherever indicated and where required to overcome obstructions and to provide pulling access to wiring. Covers for such fittings shall be accessible and unobstructed by the adjacent construction. GUA series pulling bodies rather than LB fittings and the like, shall be used for splicing purposes as well as pulling access.

3.03 RACEWAY SUPPORT

- A. All raceway systems shall be adequately and safely supported. Loose, sloppy and inadequately supported raceways will not be acceptable. Supports shall be installed at intervals not greater than those set forth by the NEC, unless shorter intervals are otherwise indicated, or unless conditions require shorter intervals of supports.
- B. Multiple runs of surface mounted conduit on concrete or masonry surfaces shall be supported off the surface by means of aluminum or stainless steel channels. Attach each slotted channel support to concrete surface by means of two (2) 1/4" diameter stainless steel bolts into drilled expansion shields.
- C. Single runs of surface mounted conduit on concrete or masonry surfaces shall be supported with hot-dipped malleable iron conduit clamps and nest-back spacers. Furnish plastic coated malleable iron conduit clamps and nest backs where corrosive areas are called out.
- D. Conduit runs that are installed along metallic structures shall be supported by means of beam clamps as specified herein.
- E. Where Aluminum is used, install neoprene spacers to prevent Aluminum from direct contact with CMU or concrete.

3.04 LABELING

- A. In addition to labeling requirements as specified throughout this and other Sections, install wiring and raceway labeling as follows:
1. Apply identification labels as specified to empty conduits to identify each conduit as to terminus of other end and also to identify trade size of conduit.
 2. Where active conduits terminate into bottoms of motor control centers, install label on each conduit terminus and show number and size of wiring and function of circuitry and trade size of conduit.

END OF SECTION

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SECTION 16120

WIRE AND CABLE

PART 1 – GENERAL

1.01 SCOPE

This section shall include wire and cable, terminating devices, splice kits, labeling, and appurtenances.

1.02 STANDARDS

A. ASTM

1.03 SUBMITTALS AND SHOP DRAWINGS

Process catalog submittals for the following:

1. Power and control cable
2. Conductor Connectors
3. Tape Products
4. Labels

PART 2 - PRODUCTS

2.01 WIRE AND CABLE

- A. All conductors shall be soft-drawn annealed copper, Class B stranding that meets ASTM B-8. Copper conductors shall be uncoated, except as otherwise specified.
- B. Single conductor cable for power, control, and branch circuits shall have cross-linked polyethylene insulation, rated for 600 volts. Cable shall be NEC type XHHW-2. All such cable shall be rated for wet or dry use. Cable insulation shall be color coded with factory pigmented colors below size #6 awg. Color coding shall be as specified under Part 3 of this section. Cable shall be as manufactured by Southwire or equal.
- C. Ground mat and associated upcomers and grounding conductors shall be tin-plated stranded copper.

2.02 CONNECTORS

- A. Mechanical connectors for 600V class wiring shall be tin-plated copper alloy bolted pressure type with bronze tin-plated hardware. Furnish connectors as follows:

<u>TYPE</u>	<u>MANUFACTURER & TYPE</u>
Single conductor to flat-plate connector	Blackburn LH
Multiple conductor to flat-plate connector	Blackburn L2H, L3H, L4H
Split-bolt connector	Blackburn HPS
Two-bolt parallel connector with spacer	Blackburn 2BPW
Cross Connector	Blackburn XT
Splice Connector	Blackburn S
Flush ground connector	OZ Type "VG"

B. Insulated spring wire connectors, "wire-nuts", for small building wire taps and splices shall be plated spring steel with thermoplastic jacket and pre-filled sealant. Connector shall be rated for 600 volts, 75 degrees C continuous. Furnish King Technology, or equal.

C. Connectors for control conductor connections to screw terminals shall be crimp-type with vinyl insulated barrel and tin-plated copper ring-tongue style connector. Furnish T&B "Sta-Kon", 3M "Scotchlok", or equal.

D. Terminal strips for miscellaneous field terminations of control and instrumentation circuits shall consist of 12 point box lug terminals with marking surface. Terminal assembly shall accept #18 to #12 awg and shall be rated 600 volts. Furnish Allen-Bradley #1492-HJ812 terminal blocks.

2.03 INSULATING PRODUCTS

A. Tape products shall be furnished as hereinafter specified and shall be Plymouth, Okonite, 3M, or equal.

B. General purpose electrical tape shall be 7 mil thick stretchable vinyl plastic, pressure adhesive type, "Slipknot Grey", 3M Scotch 33+, or equal.

C. Insulating void-filling tape and high voltage bedding tape shall be stretchable ethylene propylene rubber with high-tack and fast fusing surfaces. Tape shall be rated for 90

degrees C continuous, 130 degrees C overload, and shall be moisture-proof. Void filling tape shall be "Plysafe", 3M Scotch 23, or equal.

D. High temperature protective tape shall be rated 180oC continuous indoor/outdoor, stretchable, self-bonding silicone rubber. High temperature tape shall be Physil #3455, 3M Scotch 70, or equal.

E. Insulation putty filler-tape shall be Plymouth #32074, 3M Scotchfill, or equal.

F. Arc and fireproofing tape shall be Plymouth #3318, 3M Scotch #70 or equal.

2.04 LABELS

A. Colored banding tape shall be 5 mil stretchable vinyl with permanent solid color. Colors shall be as hereinafter specified. Tape shall be Plymouth "Slipknot 45", 3M Scotch #35, or equal.

B. Numbered wire marking labels shall be PVC sleeve-type markers, T&B, Brady or equal. Markers using adhesive are not acceptable.

C. Cable identification ties shall be weather resistant polyester with blank write-on space, T&B, Brady or equal.

2.05 MISCELLANEOUS MATERIAL

A. Cable grips shall be 316 SS grip-type wire mesh with machined metal support. Furnish Kellems, Appleton, or equal products.

B. Wire pulling compound shall be non-injurious to insulation and to conduit and shall be lubricating, non- crumbling, and non-combustible. Furnish Gedney "Wire- Quick", Ideal "Yellow" or equal.

PART 3 – EXECUTION

3.01 POWER AND CONTROL CABLE

A. Power and control conductors shall be sized as shown and where no size is indicated, the conductor size shall be #12 awg for power circuits #14 awg for 120 vac control circuits, and #16 awg for instrumentation circuits.

B. Equipment grounding conductors shall be installed with type XHHW insulated stranded copper conductors and the insulation color shall be green in sizes up to and including #10 awg.

C. Color coding shall be as follows. Non-factory color coded cables shall be marked with specified color tape. Use the following colors:

CONDUCTOR	120/208V SYSTEMS	480V SYSTEMS
Phase A or L1	Black	Brown
Phase B or L2	Red	Orange
Phase C	Blue	Yellow
Neutral	White	N/A
Ground	Green	Green

- D. Branch circuits may be spliced for receptacle, lighting and small appliance load inside appropriate junction boxes. Feeders, branch circuit, power wiring, control wiring, and signal wiring shall be installed without splice.
- E. Except as otherwise specified, taps and splices with #10 AWG and smaller, shall be made with insulated spring wire connectors. Such connectors in damp or wet locations shall be waterproofed by filling interstices around wires with silicone rubber and further insulating with an envelope of stretched piece of EPR tape around each wire. Then, apply one-half lapped layer of electrical tape over all.
- F. Motor connections made with #10 AWG and smaller wire shall be made up with set-screwed copper lugs with threaded-on insulating jacket. After make-up of each connector, install two (2) layers half-lapped, of high temperature tape over connector barrel and down one (1") inch over wires.
- G. Taps, splices, and connections in #8 AWG and larger wires shall be made with copper alloy bolted pressure connectors. Each such connector shall be insulated by means of applying insulation putty over sharp edges so as to present a smooth bonding surface. Next, apply at least four (4) layers, half-lapped each layer of EPR tape. Then, make final wrapping of at least three (3) layers, half-lapped each layer of electrical tape.
- H. Control wiring connections to stud type and screw type terminals shall be made with ring-tongue type crimp connectors. Label each terminal jacket with wire marking label at each connection.
- I. Each wire connection shall be made up tightly so that resistance of connection is as low as equivalent length of associated conductor resistance.
- J. Numbered marking labels shall be installed to identify circuit numbers from panelboards. Install labels on each wire in each panelboard, junction, pullbox and device connection.
- K. Label each wiring run with write-on waterproof labels inside motor control center. Install write-on label ties around wire group at conduit entrance and write-on label the

wire size, conduit size and service.

- L. Install PVC sleeve type numbered marking on each control wire termination at each terminal strip and at each device. Do this in motor control center, terminal cabinets, safety switches, remote controllers, pilot operators, and instrumentation equipment. Number selected shall correspond to number on terminal strip.
- M. All wiring inside equipment enclosures shall be neatly trained and laced with nylon tie wraps.

3.02 GROUND WIRING

- A. Each item of equipment shall be adequately and thoroughly grounded. Comply with Article 250 of N.E.C., except where higher standards of grounding have been specified. In addition to requirements as specified under Section 16450, install grounding for general wiring systems as follows.
- B. Equipment grounding conductors (EGC) shall be installed in each run of power and control conduits. These wires shall be green colored in sizes #6 AWG and smaller and green banded in larger sizes. Ground wires shall be type XHHW-2 insulated copper wires.
- C. EGC runs into equipment shall be grounded to equipment bus where available, or to equipment ground lugs.
- D. Where grounding type bushings are installed, bond EGC thereto, and furthermore, ground each bushing lug to equipment ground bus or ground lug, or ground rod.

3.04 LABELING

- A. In addition to labeling requirements as specified throughout this Section, install wiring and raceway labeling as follows:
 - 1. Apply numbered wire marking labels to control wiring terminations for each termination in each item of equipment. Use PVC sleeve type labels.
 - 2. Apply numbered wire marking labels to power and control wiring terminations in motor control centers, panelboards, and at outlets, to identify circuit numbers. Use PVC sleeve type labels.
 - 3. Apply numbered wire marking labels to each signal wire termination in each instrument junction box, and in each item of equipment served by instrumentation circuits. Use PVC sleeve type labels.
 - 4. Apply write-on identification labels to wiring sets in each motor control center, and in each pullbox and junction box. Show wire size, conduit size, and line and load

information. Use waterproof plastic write-on labels with nylon tie-wraps.

3.05 TESTING

- A. Each run of 600V class power and control wiring shall be tested prior to connection of line and load. Make tests with 1000V dc hand-crank or motor driven ohmmeter. Each run of wiring shall be tested phase-to-phase and/or phase-to-neutral, and phase-to-ground. Test results for each test shall be equal to or greater than 25,000,000 ohms with 1000V dc applied. All tests shall be made in the presence of the Owners representative or Engineer.
- B. Test all runs of signal wiring with 250V dc megger. Insulation values shall meet or exceed 1,000,000 ohms per 100 feet (cable to shield).
- C. Should any cable or circuit fail to meet the above tests, replace wire and retest.

END OF SECTION

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SECTION 16199

MISCELLANEOUS

PART 1 – GENERAL

1.01 SCOPE

- A. This section shall include wiring devices, disconnect switches, and equipment stands and telephone cabinets.
- B. Furnish and install all such devices and completely connect and wire each device.

1.02 SUBMITTALS AND SHOP DRAWINGS

- A. Process catalog submittals, and equipment data for the following:
 - 1. Wiring Devices
 - 2. Wiring Device Covers
 - 3. Wiring Device Boxes
 - 4. Panelboards
 - 5. Disconnect switches
 - 6. Terminal strips
- B. Submit shop drawings for equipment stands. Furnish panel board schedules with submittals.

PART 2 - PRODUCTS

2.01 WIRING DEVICES

- A. All wiring devices shall be specification grade and shall meet NEMA WD-1 requirements. Color shall be brown, unless otherwise indicated.
- B. Cover plates for wiring devices shall be Appleton FSK series unless otherwise noted on the drawings. Boxes shall be Appleton type FD, cast aluminum, raised-lid type. Furnish integral mounting feet where called for on the drawings. Furnish multi-gang units for two or more switches.
- C. Furnish the following miscellaneous wiring devices:
 - 1. Single-pole, single-throw, 20A toggle switch shall be Arrow-Hart #1221, or equal.
 - 2. Single-pole, double-throw (three-way) 20A toggle switch shall be Arrow-Hart #1223, or equal.
- D. Weather proof GFCI receptacles shall each consist of the following:
 - 1. 1-gang cast metal box with mounting feet.

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2. Bryant #GFR82FT-GRY hospital grade, 15 amp GFCI receptacle.
3. Bryant #RB5781-0 weatherproof flip lid deep cover meeting NEC article 410-57b (suitable for wet locations “while in use”).

2.02 TERMINAL STRIPS

- A. Terminal strips for installation in junction boxes and the like shall be 600 volt, rated for 25 amps with tin-plated copper box lugs.
- B. Furnish Allen-Bradley type 1492-HJ812 or equal in quantities as required.

2.03 POLE MOUNTED RECEPTACLE TRANSFORMER

- A. Transformers shall be provided in each pole for receptacle. Transformer shall be rated 300 VA with 277 volt primary and 120 volt secondary. Provide Cooper Lighting model H277 or equal.
- B. Provide fabricated support bracket for mounting transformer in base of pole. Bracket shall be constructed of 2" by 1/4" plate steel with mounting holes in base and 1/2" knockout for mounting transformer. Bracket shall be hot dipped galvanized after fabrication. Coat bottom with Bitumastic coating for mounting to dissimilar aluminum pole base.

2.03 EQUIPMENT STANDS

- A. Equipment stands shall be constructed of fabricated steel and hot-dipped galvanized after fabrication.

2.05. CONTROL PANELS

- A. Control panels for lighting shall be as specified on the drawings.

PART 3 - EXECUTION

3.01 WIRING DEVICES

- A. Provide wiring from transformer to factory installed receptacle in each pole.

3.02 RECEPTACLE TRANSFORMER

- A. Furnish receptacle transformer and fabricated bracket in each pole..
- B. Coat bottom of transwith Bitumastic coating for mounting to dissimilar aluminum pole base.

END OF SECTION

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SECTION 16410

UNDERGROUND ELECTRICAL

PART 1 – GENERAL

1.01 SCOPE OF WORK

Furnish and install a system of underground raceways and wiring as shown on the drawings.

1.02 APPLICATIONS

Except as otherwise shown on the Drawings, or otherwise specified, all underground and in-slab conduit raceways shall be of the following type:

1. Except as otherwise specified, all power and control underground conduit runs shall be made with schedule 40 PVC. Bends to grade shall be made with plastic coated rigid aluminum conduit. All conduit coming out of the ground in grass areas shall have concrete mow protection as detailed on the drawings. Plastic coated conduit in all cases shall extend 3" above the concrete.
2. All instrumentation underground conduit runs shall be made with schedule 40 PVC conduit with plastic coated rigid metallic conduit upturns. A 24" separation shall be maintained from power conduit ductbanks.

1.03 SUBMITTALS

Process submittals for the following:

1. Non Metallic conduit
2. Metallic conduit
3. Grounding Bushings
4. Buried conduit marker tape
5. Conduit supporting saddles

1.04 RELATED WORK SPECIFIED UNDER OTHER SECTIONS

- A. Refer to Section 16110 for raceways.
- B. Refer to Section 16120 for wiring.
- C. Refer to Section 16450 for grounding.
- D. Refer to general conditions for concrete.

PART 2 - PRODUCTS

2.01 RACEWAYS

Raceways shall be as specified in Section 16110.

2.02 MISCELLANEOUS

- A. Gravel for underbedding of conduits shall be washed type pea gravel.
- B. Plastic saddles for spacing and supporting conduits shall be interlocking types as manufactured by Cantex.
- C. Plastic marker label tape for buried conduits shall be yellow background with black letters with repetitive marking "ELECTRIC LINE" on yellow background, continuous along its length. Furnish T&B #NA-0608, or equal tape.
- D. Handholes shall be non-metallic type with H20 rating and "ELECTRICAL" cast into the cover. Furnish Old Castle products as indicted on the drawings or approved equal.

PART 3 - EXECUTION

3.01 EXCAVATION AND BACKFILLING

- A. Do all excavating and backfilling necessary for the installation of the work. This shall include shoring and pumping in ditches to keep them dry until the work has been installed.
- B. All excavations shall be made to proper depth, with allowances made for floors, forms, beams, piping, finished grades, etc. Ground under conduits shall be undisturbed earth or if disturbed, mechanically compacted to a density ratio of 95% before conduits are installed.
- C. All backfilling shall be made with selected soil, free of rocks and debris, and shall be pneumatically tamped in six (6") inch layers to secure a field density ratio of 95%.
- D. Field check and verify the locations of all underground utilities prior to any excavating. Avoid disturbing these as far as possible. In the event existing utilities are broken into or damaged, they shall be repaired so as to make their operation equal to that before the trenching was started.
- E. All underground conduits shall be sand encased.
- F. Where conduits turn up provide 6" rise of concrete encasement to protect conduit from mowing.

3.02 RACEWAYS

- A. All underground conduits shall be PVC schedule 40 unless otherwise noted. All bends to grade shall be made with plastic coated rigid metallic conduits and shall extend to 6" above grade. Conduits shall be watertight over the entire length of the underground run.
- B. Install all power, control, and signal wiring. Label each single conductor wire at each connection with PVC sleeve type wire labels. Label each signal cable at each end with plastic waterproof write-on type label to identify terminal connection and function and device served.
- C. Where empty conduits terminate into equipment install blank "disc" under grounding bushing and bring specified foot-marked pull tape through disc. Label each end of each pull tape with waterproof plastic label to identify terminus of other end and also show conduit size.

3.03 WIRING

All underground wiring runs shall be installed from line to load without splice.

END OF SECTION

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SECTION 16450

GROUNDING SYSTEMS

PART 1 - GENERAL

1.01 SCOPE

- A. Furnish and install complete grounding systems in accordance with Article 250 of the National Electrical Code as shown on the Drawings and as specified herein.
- B. Provide ground mat grounding electrode system as shown on the drawings and as specified herein.

1.02 SUBMITTALS

Submit manufacturers' catalog sheets with catalog numbers marked for the items furnished, which shall include:

1. Ground well casings
2. Ground rods
3. Terminal lugs and clamps
4. Exothermal welding materials
5. Ground cable
6. Ground connection hardware

PART 2 - PRODUCTS

2.01 GROUNDING ELECTRODES

- A. All ground mat grounding electrodes and grounding electrode conductors shall consist of tin plated stranded copper.
- B. All ground rods shall be copper clad steel products, 3/4" diameter x 10 foot long, unless otherwise indicated. Ground rods shall be Blackburn #6258, or equal. Provide heavy duty ground rod clamps, exothermic welds where concealed or below grade. Equal to Blackburn #GG58 where vertical connections are installed and #GUV where U-bolt connectors are installed to serve horizontal connections.

2.02 GROUNDING DEVICES

- A. Connectors shall be furnished as specified under Section 16120.
- B. Conduit grounding bushings shall be furnished as specified under Section 16110.

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- C. Equipment grounding conductors shall be furnished as specified under Section 16210.
- D. Flush cast metal grounding plates shall consist of bronze body with flat plate on top and bolted clamp connector on bottom. Furnish OZ type "VG", or equal flush connectors. Each such connector shall be furnished with silicon bronze connector bolts for installation of top-mounted grounding connectors.
- E. Exothermal welding kits shall be "Cadweld" products as manufactured by Erico. Molds, cartridges, powder, and accessories shall be as recommended by the manufacturer.

2.03 GROUND TEST WELLS

- A. Ground test wells shall be furnished each ground rod for the purpose of field testing the ground mat system.
- B. Ground test wells shall each consist of ground rod with connector attached to a #4 upcomer from the ground mat and contained within an access well with labeled top.
- C. Ground test well enclosures shall be Brooks product #3RT series, or equal. Enclosures shall be 10 1/4" diameter and shall include cast iron cover with integrally cut "GROUND TEST WELL" in top of cover.

2.04 CHEMICAL GROUND WELLS

- A. Furnish chemical ground wells where indicated on the drawings. Core drill concrete floors as required to install ground well.
- B. Chemical ground well kits shall be Erico "GEM" series.

PART 3 - EXECUTION

3.01 GROUND MATS AND GROUND WELLS

- A. Install ground mat around the perimeter and under the new foundations as shown. Use #4/0 AWG tin-plated copper stranded conductor for the ground mat. Install upcomer with indicated wire sizes of tin plated copper conductors. Exothermally weld all connections.
- B. Unless other larger sizes are indicated on the drawings, install #2 upcomers from ground mat to RTU, and other equipment indicated on the drawings. Install "VG" flush floor connector to serve each upcomers and run #2 stingers from top side of each "VG" to ground bus in equipment. Bond VG to rebar in concrete.
- C. Install ground rods in test wells where indicated on the drawings.
- D. Install chemical grounding kits where called for. Drill holes as required and install kit per

manufacturer's instructions. Exothermic weld all concealed, imbedded in concrete or buried connections.

3.02 TRANSFORMER

- A. Bond transformer neutral to cabinet.
- B. Install grounding electrode conductor from each transformer neutral to system ground and to local electrodes as shown. Run #2 ground wire to ground mat.

3.03 WIRING SYSTEMS GROUNDING

- A. All equipment enclosures, motor and transformer frames, metallic conduit systems and exposed structural steel systems shall be grounded.
- B. Equipment grounding conductors shall be run with all wiring. Sizes of equipment grounding conductors shall be based on Article 250 of the N.E.C. except where larger sizes may be shown. Bond each equipment grounding conductor to the equipment grounds at each end of each run. Run 4/0 ground full length of tray, bond to each section and every enclosure where conductors originate or terminate. Protect grounded equipment conductor in conduit where it leaves the tray.
- C. Liquid tight flexible metal conduit in sizes 1" and larger shall be equipped with external bonding jumpers. Use liquid tight connectors integrally equipped with suitable grounding lugs.
- D. Where conduits enter into equipment free of the metal enclosure, install grounding bushing on each conduit and bond bushing lug to equipment ground bus.
- E. Where conduits enter equipment enclosures, equip each penetration inside with grounding bushing. Install bonding jumper from each grounding bushing to ground bus.
- F. Equipment enclosures that do not come furnished with a ground bus, install ground lug in each enclosure that shall be bonded to the metal cabinet or backpan of the enclosure.
- G. Separately derived systems shall be each grounded as shown and shall comply with Article 250 of the NEC except where higher standards are shown.

3.04 TESTING

- A. All exothermic weld connections shall successfully resist moderate hammer blows. Any connection which fails such test or if upon inspection, weld indicates a porous or deformed connection, the weld shall be remade.
- B. All exothermic welds shall encompass 100 percent of the ends of the materials being welded. Welds which do not meet this requirement shall be remade.

- C. Test the ground resistance of the system. All test equipment shall be furnished by Contractor and be approved by Engineer. Test equipment shall be as manufactured by Bidle or approved equal. Dry season resistance of the system shall not exceed five ohms. If such resistance cannot be obtained with the system as shown, provide additional grounding as directed by Engineer.

END OF SECTION

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SECTION 16500

LIGHTING

PART 1 - GENERAL

1.01 SCOPE

- A. Furnish and install complete lighting systems in as shown on the Drawings and as specified herein.

1.02 REFERENCE STANDARDS

- A. Illumination Engineering Society of North America (IESNA)
- B. American Association of State Highway and Transportation Officials (AASHTO)

1.03 SUBMITTALS

Submit manufacturers' catalog sheets with catalog numbers marked for the items furnished, which shall include:

1. Light fixtures
2. Poles

PART 2 - PRODUCTS

2.01 LIGHT FIXTURES

- A. Light fixtures shall be Sternberg ACORNS Type 3, model number G743 refractorized glass. Light source shall be 150 Watt HPS. Socket type shall be medium base. Ballast shall be multi-tap with 277 volt tap utilized. Ballasts shall be stabilized type for specified lamp and shall be General Electric, Osram-Sylvania or Philips.
- B. Pole shall be 10' tall and shall be decorative type and same manufacture as light fixture. Pole shall be 5" to 3" tapered and constructed of 6063-T6 structural grade aluminum. Pole base shall be transformer type with large access door. Pole shall have 15 amp GFCI receptacle at top just below light fixture. Transformer for receptacle shall be per section 16199.
- C. Pole and fixture shall be Sternberg type G743 508G 7710T5.

PART 3 – EXECUTION

3.01 GENERAL

- A. Install light fixtures and poles as indicated on the drawings.
- B. Install transformer and mounting bracket in base of pole and fuse assembly.

END OF SECTION

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7636 Pebble Drive
Fort Worth, Texas 76118
www.cmjengr.com

July 16, 2014

Kimley-Horn & Associates, Inc.
2201 W. Royal Lane, Suite 275
Irving, Texas 75063

Attn: Mr. Jay VonAhsen, P.E.

**RE: CMJ PROJECT NO. 103-12-147
INTERSECTION IMPROVEMENTS
LEWISVILLE, TEXAS**

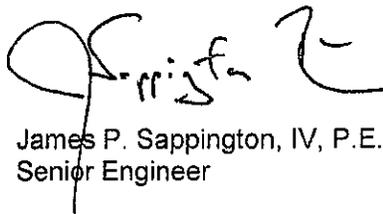
Dear Mr. VonAhsen:

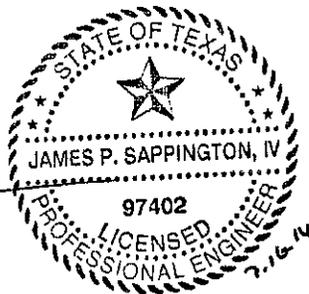
Following a July 16, 2014 e-mail conversation with you, the following recommendation is provided for site paving. The original geotechnical report (CMJ Project No. 103-12-147 dated January 15, 2013) provides subgrade preparation recommendations consisting of lime stabilization or the alternate for a flexible base subgrade.

In lieu of a lime stabilized subgrade or flexible base subgrade, the recommended pavement thicknesses presented in CMJ's referenced geotechnical report may be increased by 2 inches, and placed atop a properly compacted subgrade.

Please contact us should questions arise on information contained herein.

Respectfully,
CMJ ENGINEERING, INC.
TEXAS FIRM REGISTRATION NO. F-9177


James P. Sappington, IV, P.E.
Senior Engineer



copies submitted: (1) Mr. Jay VonAhsen, P.E.; Kimley-Horn & Associates, Inc.

**GEOTECHNICAL ENGINEERING STUDY
INTERSECTION IMPROVEMENTS
LEWISVILLE, TEXAS**

Presented To:

Kimley-Horn & Associates, Inc.

January 2013

PROJECT NO. 103-12-147



7636 Pebble Drive
Fort Worth, Texas 76118
www.cmjengr.com

January 15, 2013
Report No. 103-12-147

Kimley-Horn & Associates, Inc.
2201 W. Royal Lane, Suite 275
Irving, Texas 75063

Attn: Mr. Jay VonAhsen, P.E.

**GEOTECHNICAL ENGINEERING STUDY
INTERSECTION IMPROVEMENTS
LEWISVILLE, TEXAS**

Dear Mr. VonAhsen:

Submitted here are the results of a geotechnical engineering study for the referenced project. This study was performed in general accordance with CMJ Proposal 12-3939 (Revised) dated October 2, 2012. The geotechnical services were authorized on November 2, 2012.

Engineering analyses and recommendations are contained in the text section of the report. Results of our field and laboratory services are included in the appendix of the report. We would appreciate the opportunity to be considered for providing the materials engineering and geotechnical observation services during the construction phase of this project.

We appreciate the opportunity to be of service to Kimley-Horn & Associates, Inc. Please contact us if you have any questions or if we may be of further service at this time.

Respectfully submitted,
CMJ ENGINEERING, INC.
TEXAS FIRM REGISTRATION NO. F-9177

A handwritten signature in black ink, appearing to read 'J. Sappington IV', is written over the typed name.

James P. Sappington IV, P.E.
Project Engineer
Texas No. 97402



copies submitted: (3) Mr. Jay VonAhsen, P.E.; Kimley-Horn & Associates, Inc.

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APPENDIX A

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1.0 INTRODUCTION

1.1 General

This report presents the results of a geotechnical engineering study for the reconstruction of three intersections utilizing Portland cement concrete (PCC) sections in Lewisville, Texas. These intersections are located as follows:

- MacArthur at Highland
- N. Mill St. at E. College St.
- MacArthur at Lake Vista

The existing non-signalized intersection at MacArthur at Highland will include signalization as part of the reconstruction as well as new signals at the Mill at College intersection. Plates A.1A through A.1C, Plans of Borings, depicts the various project site vicinities approximate locations of exploration borings.

1.2 Purpose and Scope

The purpose of this geotechnical engineering study has been to determine the general subsurface conditions, evaluate the engineering characteristics of the subsurface materials encountered, provide pavement design guidelines, develop recommendations for the type or types of foundations suitable for the proposed signals, and provide earthwork recommendations.

To accomplish its intended purposes, the study has been conducted in the following phases: (1) drilling sample borings to determine the general subsurface conditions and to obtain samples for testing; (2) performing laboratory tests on appropriate samples to determine pertinent engineering properties of the subsurface materials; and (3) performing engineering analyses, using the field and laboratory data to develop geotechnical recommendations for the proposed construction.

The design is currently in progress and the locations and/or elevations of the structure could change. The recommendations contained in this report are based on data supplied by Kimley-Horn & Associates, Inc. Once the final design is near completion (80-percent to 90-percent stage), it is recommended that CMJ Engineering, Inc. be retained to review those portions of the construction documents pertaining to the geotechnical recommendations, as a means to determine that our recommendations have been interpreted as intended.

1.3 Report Format

The text of the report is contained in Sections 1 through 8. All plates and large tables are contained in Appendix A. The alpha-numeric plate and table numbers identify the appendix in which they appear. Small tables of less than one page in length may appear in the body of the text and are numbered according to the section in which they occur.

Units used in the report are based on the English system and may include tons per square foot (tsf), kips (1 kip = 1,000 pounds), kips per square foot (ksf), pounds per square foot (psf), pounds per cubic foot (pcf), and pounds per square inch (psi).

2.0 FIELD EXPLORATION AND LABORATORY TESTING

2.1 Field Exploration

Subsurface materials at the project site were explored by four (4) vertical soil borings. Borings B-1 through B-3 were drilled to a depth of 20 feet and Boring B-4 was drilled to a depth of 8 feet. The borings were drilled using continuous flight augers at the approximate locations shown on the Plans of Borings, Plates A.1A through A.1C. The boring logs are included on Plates A.4 through A.7 and keys to classifications and symbols used on the logs are provided on Plates A.2 and A.3.

Undisturbed samples of cohesive soils were obtained with nominal 3-inch diameter thin-walled (Shelby) tube samplers at the locations shown on the logs of borings. The Shelby tube sampler consists of a thin-walled steel tube with a sharp cutting edge connected to a head equipped with a ball valve threaded for rod connection. The tube is pushed into the soil by the hydraulic pulldown of the drilling rig. The soil specimens were extruded from the tube in the field, logged, tested for consistency with a hand penetrometer, sealed, and packaged to limit loss of moisture.

The consistency of cohesive soil samples was evaluated in the field using a calibrated hand penetrometer. In this test a 0.25-inch diameter piston is pushed into the relatively undisturbed sample at a constant rate to a depth of 0.25 inch. The results of these tests, in tsf, are tabulated at respective sample depths on the logs. When the capacity of the penetrometer is exceeded, the value is tabulated as 4.5+.

Ground-water observations during and after completion of the borings are shown on the upper right of the boring log. Upon completion of the borings, the bore holes were backfilled with soil cuttings and plugged at the surface by hand tamping.

2.2 Laboratory Testing

Laboratory soil tests were performed on selected representative samples recovered from the borings. In addition to the classification tests (liquid limits and plastic limits), moisture content, unconfined compressive strength, and unit weight tests were performed. Results of the laboratory classification tests, moisture content, unconfined compressive strength, and unit weight tests conducted for this project are included on the boring logs.

Soluble sulfate tests were conducted on selected soil samples recovered from the borings. The sulfate testing was conducted to help identify sulfate-induced heaving potential of the soils. Sulfate-induced heaving can cause detrimental volumetric changes to a lime stabilized subgrade. The result of the sulfate tests are presented on Plate A.8.

Eades and Grim Lime Series tests were performed on selected samples to identify the appropriate concentration of lime to add to soils for stabilization purposes. The results of the lime series tests are presented on Plates A.9 and A.10.

The above laboratory tests were performed in general accordance with applicable ASTM procedures, or generally accepted practice.

3.0 SUBSURFACE CONDITIONS

3.1 Site Geology

According to the Dallas and Sherman Sheets of the Geologic Atlas of Texas, the various project sites are geologically located in Alluvium and Fluvial Terrace Deposits overlying the Eagle Ford Formation. The alluvial and terrace deposits are generally a mixture of fine-grained and coarse materials, which are typically layered with grain sizes increasing with depth. At the surface the clay portions of these deposits can be moderately to highly active. Ground-water is typically present in these deposits, especially in the proximity of a river or creek.

3.2 Soil Conditions

Specific types and depths of subsurface strata encountered at the boring locations are shown on the boring logs in Appendix A. The generalized subsurface stratigraphy encountered in the borings is discussed below. Note that depths on the borings refer to the depth from the existing grade or ground surface present at the time of the investigation, and the boundaries between the various soil types are approximate.

Existing pavement present in Borings B-2 and B-3 consist of 2 to 2½ inches of brick pavers overlying a 2-inch thick leveling sand. Concrete underlying the paver system consists of a 6 to 9 inch concrete section. Concrete is present at the surface in Borings B-1 and B-4, with thicknesses of 6½ and 8¾ inches, respectively.

At the College and Mill site (Boring B-1), variable soils are present at the surface, typical of fluvatile terrace deposits. Light brown and gray sandy clays extend to 12 feet, transitioning to light brown and gray clayey sand with sand seams. Light brown and gray shaly clays are next present at 15 feet and continue through boring termination at 20 feet. At the remaining sites along MacArthur more uniform conditions were encountered. Soils consist of brown clays of high plasticity, grading light brown below 12- to 15-foot depths. Borings B-2 through B-4 were terminated within these highly plastic clays at 8 to 20 feet.

The various clays encountered in the borings had tested Liquid Limits (LL) ranging from 39 to 70 with Plasticity Indices (PI) ranging from 26 to 47 and are classified as CL and CH by the USCS. The various clayey soils were generally stiff to hard (soil basis) in consistency with pocket penetrometer readings of 2.0 to over 4.5 tsf. Firm soils (soil basis) are noted from 2 to 4 feet in Boring B-4. The clays had tested unit weight values ranging from 87 to 117 pcf, and unconfined compressive strength values were 1,870 to 5,580 psf. The sample tested at 14 to 15 feet in Boring B-1 reflects more granular materials while the remaining tested samples reflect slickensided characteristics. These conditions indicate in-situ strengths to be higher than the tested values.

The Atterberg Limits tests indicate the clays encountered at these sites are moderately active to highly active with respect to moisture induced volume changes. Active clays can experience volume changes (expansion or contraction) with fluctuations in their moisture content.

3.3 Ground-Water Observations

The borings were drilled using continuous flight augers in order to observe ground-water seepage during drilling. Ground-water seepage was not encountered during drilling and all borings were dry at completion of drilling operations. While it is not possible to accurately predict the magnitude of subsurface water fluctuation that might occur based upon these short-term observations, it should be recognized that ground-water conditions will vary with fluctuations in rainfall.

Fluctuations of the ground-water level can occur due to seasonal variations in the amount of rainfall; site topography and runoff; hydraulic conductivity of soil strata; and other factors not evident at the time the borings were performed. Ground-water can occur in joints in the clays or via more permeable strata.

4.0 PAVEMENTS

4.1 General Considerations

The average subgrade soil consists of primarily moderately to highly plastic sandy clays and clays. The success of the pavement subgrade is subgrade soil strength and control of water. Adequate subgrade performance can be achieved by stabilizing existing soils and fills used to construct the pavement subgrade. Stabilization of the variable subgrade soils can be accomplished with the addition of hydrated lime.

On-site soils are moderately to highly plastic and subject to expansive movement with soil wetting and drying. Estimates of expansive movement potential are on the order of 4 to 5¼ inches at the MacArthur sites and 2½ inches at the College and Mill site. Movements in excess of these estimates can occur if poor drainage, excessive water collection, leaking pipelines, etc. occur. Any such excessive water conditions should be rectified as soon as possible. In order to minimize rainwater infiltration through the pavement surface, and thereby minimizing future upward movement of the pavement slabs, all cracks and joints in the pavement should be sealed on a routine basis after construction.

4.2 Sulfate-Induced Heaving

Soluble sulfate testing was conducted to check for sulfate-induced heaving potential. Sulfate-induced heaving is caused when hydrated lime is added to a soil with high sulfate concentration. The lime reacts with the sulfates to cause potentially large volumetric changes in the soil.

Soluble sulfate levels in soils on the order of 2,000 parts-per-million (ppm) or less are usually of low concern and warrant only observation of the subgrade during the stabilization process. The tested samples for soluble sulfate levels were below the tested detectable level of 100 ppm. Since the samples tested were below 2,000 ppm, a single-lime process is recommended. The single-lime treatment is described in Section 4.3. In addition, it is recommended that during the curing period of the lime treatment, the subgrade be supplied with ample moisture to allow proper hydration of the lime, and it should be checked for any volumetric changes that may indicate a sulfate-induced heaving condition.

4.3 Pavement Subgrade Preparation

The moderately to highly plastic sandy clays and clays are subject to loss in support value with the moisture increases which occur beneath pavement sections. They react with hydrated lime, which serves to improve and maintain their support value. Treatment of these soils with hydrated lime will improve their subgrade characteristics to support area paving.

Lime treatment is recommended for all subgrade areas. Prior to lime stabilization, the subgrade should be proofrolled with heavy pneumatic equipment. Any soft or pumping areas should be undercut to a firm subgrade and properly backfilled as described in the Earthwork section.

The stabilized subgrade should be scarified to a minimum depth of 6 inches and uniformly compacted to a minimum of 95 percent of ASTM D 698, near minus 2 to plus 4 percentage points of the optimum moisture content determined by that test. It should then be protected and maintained in a moist condition until the pavement is placed.

It is recommended a minimum of 7 percent hydrated lime be used to modify the clay subgrade soils at the College and Mill site (Boring B-1) while 8 percent hydrated lime is recommended at the MacArthur sites. At the College and Mill site, the amount of hydrated lime required to stabilize the subgrade should be on the order of 32 pounds per square yard for a 6-inch depth or 42 pounds per square yard for an 8-inch depth. The MacArthur sites should utilize on the order of 36 pounds per

square yard for a 6-inch depth or 48 pounds per square yard for an 8-inch depth. The hydrated lime should be thoroughly mixed and blended with the upper 6 (or 8) inches of the clay subgrade (TxDOT Item 260). The hydrated lime should meet the requirements of Item 260 (Type A) in the Texas Department of Transportation (TxDOT) Standard Specifications for Construction of Highways, Streets and Bridges, 2004 Edition.

As an alternative to lime stabilization, consideration can be given to substituting a flexible base meeting TxDOT Item 247, Type A, Grades 1 or 2 on an equal basis. The option of using a flexible base in lieu of lime stabilizing the subgrade presents a relatively quick, straight forward solution to preparing the materials prior to pavement placement and reduces construction duration.

It is recommended that subgrade stabilization extend to at least one foot beyond pavement edges to aid in reducing pavement movements and cracking along the curb line due to seasonal moisture variations after construction. Each construction area should be shaped to allow drainage of surface water during earthwork operations, and surface water should be pumped immediately from each construction area after each rain and a firm subgrade condition maintained. Water should not be allowed to pond in order to prevent percolation and subgrade softening, and lime should be added to the subgrade after removal of all surface vegetation and debris. Sand should be specifically prohibited beneath pavement areas, since these more porous soils can allow water inflow, resulting in heave and strength loss of subgrade soils (lime stabilized soil will be allowed for fine grading). After fine grading each area in preparation for paving, the subgrade surface should be lightly moistened, as needed, and recompacted to obtain a tight non-yielding subgrade.

Surface drainage is critical to the performance of this pavement. Water should be allowed to exit the pavement surface quickly. All pavement construction should be performed in accordance with the procedures provided in Section 4.4.

4.3 Pavement Sections

At the time of this investigation, site paving plans or vehicle traffic studies were not available. Pavement analyses were performed using methods outlined in the AASHTO Guide for Design of Pavement Structures, 1993 Edition, published by the American Association of State Highway and Transportation Officials. The design equations were solved using AASHTO Pavement Analysis Software. In the AASHTO method, traffic loads are expressed in Equivalent 18-kip Single Axle Loads (ESAL) over the design life of the pavement structure.

Based on the results of the field and laboratory investigation, fill to be placed, and on soil plasticity properties, the following design parameters were used in our thickness design calculations (soil parameters were conservatively established for the soils that are expected to exhibit lower bearing strengths):

Subgrade Soils.....	Clay and Sandy Clay
Design California Bearing Ratio	3
Design Life.....	20 years
Initial Serviceability.....	4.5
Terminal Serviceability	2.5
Reliability.....	90%
Overall Deviation.....	0.35
Load Transfer Coefficient.....	3.2
Drainage Coefficient.....	1.0
Assumed CBR value of subgrade soil	3
Assumed CBR value of lime treated soil	15
Concrete Modulus of Rupture.....	600 psi

The following alternative pavement sections are provided for a range of traffic volumes. The traffic loadings are based on the daily frequency of fully loaded, 80 kip, five-axle tractor semi-trailers over the 20-year service period. These sections are suitable for the previously mentioned assumptions. Any deviation from these assumptions should be brought to our attention immediately in order to assess their impact on our recommendations.

Pavement Section	Design ESAL	Allowable Daily Truck Repetitions (20-yr Life)
6" PCC over 6" lime stabilized subgrade	295,900	10
7" PCC over 6" lime stabilized subgrade	695,300	24
8" PCC over 6" lime stabilized subgrade	1,532,600	53
9" PCC over 8" lime stabilized subgrade	3,200,300	109
10" PCC over 8" lime stabilized subgrade	6,319,400	212

4.4 Pavement Material Requirements

Material and process specifications developed by the Texas Department of Transportation (TxDOT) have been utilized. These specifications are outlined in the TxDOT Standard Specifications for Construction of Highways, Streets and Bridges, 2004 Edition. Specific construction recommendations for rigid pavements are given below.

Reinforced Portland Cement Concrete: Reinforced Portland cement concrete pavement should consist of Portland cement concrete having a 28-day compressive strength of at least 3,500 psi. The mix should be designed in accordance with the ACI Code 318 using 3 to 6 percent air entrainment. The pavement should be adequately reinforced with temperature steel and all construction joints or expansion/contraction joints should be provided with load transfer dowels. The spacing of the joints will depend primarily on the type of steel used in the pavement. We recommend using No. 3 steel rebar spaced at 18 inches on center in both the longitudinal and transverse direction. Control joints formed by sawing are recommended every 12 to 15 feet in both the longitudinal and transverse direction. The cutting of the joints should be performed as soon as the concrete has "set-up" enough to allow for sawing operations.

Lime Stabilized Subgrade: Lime treatment for base course (road mix) - Item 262, Texas Department of Transportation Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges, 2004 Edition.

Flexible Base: Crushed Stone Flexible Base – Item 247, Type A, Grades 1 or 2, Texas Department of Transportation Standard Specifications for Construction of Maintenance of Highways, Streets, and Bridges, 2004 Edition.

4.5 General Pavement Considerations

The design of the pavement drainage and grading should consider the potential for differential ground movement due to future soil swelling of up to 2½ inches at the College and Mill site and up to 5¼ inches at the MacArthur sites. In order to minimize rainwater infiltration through the pavement surface, and thereby minimizing future upward movement of the pavement slabs, all cracks and joints in the pavement should be sealed on a routine basis after construction.

5.0 FOUNDATION RECOMMENDATIONS

5.1 General Foundation Considerations

Two independent design criteria must be satisfied in the selection of the type of foundation to support the proposed structures. First, the ultimate bearing capacity, reduced by a sufficient factor of safety, must not be exceeded by the bearing pressure transferred to the foundation soils. Second, due to consolidation or expansion of the underlying soils during the operating life of the

structure, total and differential vertical movements must be within tolerable limits. The foundations for the proposed structure are discussed below.

The moisture induced volume changes associated with the moderate to highly active clays present at this site indicate that shallow or near surface footings could be subject to differential movements of a potentially detrimental magnitude. The most positive foundation system for the proposed traffic signals would be situated below the zone of most significant seasonal moisture variations. A deep foundation system transferring column loads to a suitable bearing stratum is considered the most positive foundation system. Drilled and underreamed reinforced concrete shafts situated at 16- to 18-foot depths offer a positive foundation system and are recommended.

5.2 Drilled and Underreamed Shaft Design Parameters

Recommendations and parameters for design of the piers are outlined below, while specific recommendations for the construction and installation of the piers are included in the following section.

College and Mill Site:

Bearing Stratum	Very stiff light brown and gray SANDY CLAY
Required Depth:	12 feet below finished grade atop light brown and gray clayey sands
Allowable End Bearing Capacity:	3,000 psf
Allowable Bell/Diameter Ratio:	Minimum base to shaft diameter ratio of 2 to 1 to resist uplifts loads described below. In addition, the bell diameter should be a minimum of 24 inches larger than the shaft.

Shafts should be maintained atop the clayey sands, which may require shaft depth adjustment during construction. If shafts are overdrilled and extend into the clayey sands, that portion of the straight shaft should be plugged with concrete to the top of the clayey sands, thereafter a bell formed atop the clayey sands.

MacArthur Sites:

Bearing Stratum	Stiff to very stiff brown and light brown CLAY
Required Depth:	16 feet below finished grade
Allowable End Bearing Capacity:	3,000 psf

Allowable Bell/Diameter Ratio: Minimum base to shaft diameter ratio of 2 to 1 to resist uplifts loads described below. In addition, the bell diameter should be a minimum of 24 inches larger than the shaft.

Excavations for the underreamed shafts should be maintained in the dry. During construction one of the more important responsibilities of the pier excavation contractor and the construction materials inspection laboratory will be to verify the presence of the bearing materials encountered during construction, and that the pier excavation has not caved prior to concrete placement.

For lateral shaft resistance, an allowable passive resistance 500 psf may be considered in the overlying clays. Lateral shaft resistance should not be considered within the upper 10 feet.

Settlement of properly constructed shafts should be primarily elastic and are estimated to be less than 1.0 inch.

5.2.1 Soil Induced Uplift Loads

The drilled shafts could experience tensile loads as a result of post construction heave in the site soils. The magnitude of these loads varies with the shaft diameter, soil parameters, and particularly the in-situ moisture levels at the time of construction. In order to aid in the structural design of the reinforcement, the reinforcement quantity should be adequate to resist tensile forces based on soil adhesion equal to 1,500 psf acting over the upper 10 feet of the pier shaft. This load must be resisted by the dead load on the shaft, continuous vertical reinforcing steel in the shaft, and a shaft adhesion developed within the belled portion of the underream as previously discussed.

5.2.2 Drilled Shaft Construction Considerations

Drilled pier construction should be monitored by a representative of the geotechnical engineer to observe, among other things, the following items:

- Identification of bearing material
- Adequate penetration of the shaft excavation into the bearing layer
- The base and sides of the shaft excavation are clean of loose cuttings
- If seepage is encountered, whether it is of sufficient amount to require the use of temporary steel casing. If casing is needed it is important that the field representative observe that a

high head of plastic concrete is maintained within the casing at all times during their extraction to prevent the inflow of water

Precautions should be taken during the placement of reinforcing steel and concrete to prevent loose, excavated soil from falling into the excavation. Concrete should be placed as soon as practical after completion of the drilling, cleaning, and observation. Excavation for a drilled pier should be filled with concrete before the end of the workday, or sooner if required to prevent deterioration of the bearing material. Prolonged exposure or inundation of the bearing surface with water will result in changes in strength and compressibility characteristics. If delays occur, the drilled pier excavation should be deepened as necessary and cleaned, in order to provide a fresh bearing surface.

The concrete should have a slump of 6 inches plus or minus 1 inch. The concrete should be placed in a manner to prevent the concrete from striking the reinforcing cage or the sides of the excavation. Concrete should be tremied to the bottom of the excavation to control the maximum free fall of the plastic concrete to less than 10 feet, or focused in the middle of the reinforcing cage to prevent segregation.

In addition to the above guidelines, the specifications from the Association of Drilled Shaft Contractors Inc. "Standards and Specifications for the Foundation Drilling Industry" as Revised 1999 or other recognized specifications for proper installation of drilled shaft foundation systems should be followed.

6.0 EARTHWORK

6.1 Site Preparation

The subgrade should be firm and able to support the construction equipment without displacement. Soft or yielding subgrade should be corrected and made stable before construction proceeds. The subgrade should be proof rolled to detect soft spots, which if exist, should be reworked to provide a firm and otherwise suitable subgrade. Proof rolling should be performed using a heavy pneumatic tired roller, loaded dump truck, or similar piece of equipment. The proof rolling operations should be observed by the project geotechnical engineer or his/her representative. Prior to fill placement, the subgrade should be scarified to a minimum depth of 6 inches, its moisture content adjusted, and recompacted to the moisture and density recommended for fill. In areas of perched water or

pumping subgrade, it may be necessary to install sub-pavement drains or edge drains. This decision should be made during construction to verify the need for such drains.

6.2 Placement and Compaction

Fill material should be placed in loose lifts not exceeding 8 inches in uncompacted thickness. The uncompacted lift thickness should be reduced to 4 inches for structure backfill zones requiring hand-operated power compactors or small self-propelled compactors. The fill material should be uniform with respect to material type and moisture content. Clods and chunks of material should be broken down and the fill material mixed by disking, blading, or plowing, as necessary, so that a material of uniform moisture and density is obtained for each lift. Water required for sprinkling to bring the fill material to the proper moisture content should be applied evenly through each layer.

The on-site soils are suitable for use in site grading. Imported fill material should be clean soil with a Liquid Limit less than 50 and no rock greater than 4 inches in maximum dimension. The fill materials should be free of vegetation and debris.

The fill material should be compacted to a minimum of 95 percent of the maximum dry density determined by the Standard Proctor test, ASTM D 698. In conjunction with the compacting operation, the fill material should be brought to the proper moisture content. The moisture content for general earth fill should range from 2 percentage points below optimum to 5 percentage points above optimum (-2 to +5). These ranges of moisture contents are given as maximum recommended ranges. For some soils and under some conditions, the contractor may have to maintain a more narrow range of moisture content (within the recommended range) in order to consistently achieve the recommended density.

Field density tests should be taken as each lift of fill material is placed. As a guide, one field density test per lift for each 5,000 square feet of compacted area is recommended. For small areas or critical areas the frequency of testing may need to be increased to one test per 2,500 square feet. A minimum of 2 tests per lift should be required. The earthwork operations should be observed and tested on a continuing basis by an experienced geotechnician working in conjunction with the project geotechnical engineer.

Each lift should be compacted, tested, and approved before another lift is added. The purpose of the field density tests is to provide some indication that uniform and adequate compaction is being

obtained. The actual quality of the fill, as compacted, should be the responsibility of the contractor and satisfactory results from the tests should not be considered as a guarantee of the quality of the contractor's filling operations.

Any pavement structure (concrete, base course material or stabilized subgrade) should extend a minimum of 12 inches beyond the edge of an excavation trench. This additional width of pavement structure greatly reduces the potential for reflective cracking upwards into the pavement. In addition, proper backfilling of the soils will result in no undue settlement of backfill material and resulting differential movement between the natural soils and backfill trench. If a high class bedding material or backfill material is desired, a lean concrete will limit water intrusion into the trench and will not require compaction after placement.

6.3 Excavation

The side slopes of excavations through the overburden soils should be made in such a manner to provide for their stability during construction. Existing structures, pipelines or other facilities, which are constructed prior to or during the currently proposed construction and which require excavation, should be protected from loss of end bearing or lateral support.

Temporary construction slopes and/or permanent embankment slopes should be protected from surface runoff water. Site grading should be designed to allow drainage at planned areas where erosion protection is provided, instead of allowing surface water to flow down unprotected slopes.

Trench safety recommendations are beyond the scope of this report. The contractor must comply with all applicable safety regulations concerning trench safety and excavations including, but not limited to, OSHA regulations.

6.4 Trench Backfill

Trench backfill for pipelines or other utilities should be properly placed and compacted. Overly dense or dry backfill can swell and create a mound along the completed trench line. Loose or wet backfill can settle and form a depression along the completed trench line. Distress to overlying structures, pavements, etc. is likely if heaving or settlement occurs. On-site earth fill material is recommended for trench backfill. Care should be taken not to use loose granular material, to prevent the backfilled trench from becoming a french drain and piping surface or subsurface water beneath structures, pipelines, or pavements. If a higher class bedding material is required for the

pipelines, a lean concrete bedding will limit water intrusion into the trench and will not require compaction after placement. The density and moisture content should be as recommended for fill in this report. A minimum of one field density test should be taken per lift for each 150 linear feet of trench, with a minimum of 2 tests per lift.

6.5 Soil Corrosion Potential

Specific testing for soil corrosion potential was not included in the scope of this study. However, based upon past experience on other projects in the vicinity, the soils at this site may be corrosive. Standard construction practices for protecting metal pipe and similar facilities in contact with these soils should be used.

6.6 Utilities

Care should be taken that utility cuts are not left open for extended periods, and that the cuts are properly backfilled. Backfilling should be accomplished with properly compacted on-site soils, rather than granular materials.

Trench excavations should be sloped or braced in the interest of safety. Attention is drawn to OSHA Safety and Health Standards (29 CFR 1926/1910), Subpart P, regarding trench excavations greater than 5 feet in depth.

6.7 Erosion and Sediment Control

All disturbed areas should be protected from erosion and sedimentation during construction, and all permanent slopes and other areas subject to erosion or sedimentation should be provided with permanent erosion and sediment control facilities. All applicable ordinances and codes regarding erosion and sediment control should be followed.

7.0 CONSTRUCTION OBSERVATIONS

In any geotechnical investigation, the design recommendations are based on a limited amount of information about the subsurface conditions. In the analysis, the geotechnical engineer must assume the subsurface conditions are similar to the conditions encountered in the borings. However, quite often during construction anomalies in the subsurface conditions are revealed. Therefore, it is recommended that CMJ Engineering, Inc. be retained to observe earthwork and

foundation installation and perform materials evaluation during the construction phase of the project. This enables the geotechnical engineer to stay abreast of the project and to be readily available to evaluate unanticipated conditions, to conduct additional tests if required and, when necessary, to recommend alternative solutions to unanticipated conditions. Until these construction phase services are performed by the project geotechnical engineer, the recommendations contained in this report on such items as final foundation bearing elevations, proper soil moisture condition, and other such subsurface related recommendations should be considered as preliminary.

It is proposed that construction phase observation and materials testing commence by the project geotechnical engineer at the outset of the project. Experience has shown that the most suitable method for procuring these services is for the owner or the owner's design engineers to contract directly with the project geotechnical engineer. This results in a clear, direct line of communication between the owner and the owner's design engineers and the geotechnical engineer.

8.0 REPORT CLOSURE

The borings for this study were selected by CMJ Engineering, Inc. The locations and elevations of the borings should be considered accurate only to the degree implied by the methods used in their determination. The boring logs shown in this report contain information related to the types of soil encountered at specific locations and times and show lines delineating the interface between these materials. The logs also contain our field representative's interpretation of conditions that are believed to exist in those depth intervals between the actual samples taken. Therefore, these boring logs contain both factual and interpretive information. Laboratory soil classification tests were also performed on samples from selected depths in the borings. The results of these tests, along with visual-manual procedures were used to generally classify each stratum. Therefore, it should be understood that the classification data on the logs of borings represent visual estimates of classifications for those portions of each stratum on which the full range of laboratory soil classification tests were not performed. It is not implied that these logs are representative of subsurface conditions at other locations and times.

With regard to ground-water conditions, this report presents data on ground-water levels as they were observed during the course of the field work. In particular, water level readings have been made in the borings at the times and under conditions stated in the text of the report and on the

boring logs. It should be noted that fluctuations in the level of the ground-water table can occur with passage of time due to variations in rainfall, temperature and other factors. Also, this report does not include quantitative information on rates of flow of ground water into excavations, on pumping capacities necessary to dewater the excavations, or on methods of dewatering excavations. Unanticipated soil conditions at a construction site are commonly encountered and cannot be fully predicted by mere soil samples, test borings or test pits. Such unexpected conditions frequently require that additional expenditures be made by the owner to attain a properly designed and constructed project. Therefore, provision for some contingency fund is recommended to accommodate such potential extra cost.

The analyses, conclusions and recommendations contained in this report are based on site conditions as they existed at the time of our field investigation and further on the assumption that the exploratory borings are representative of the subsurface conditions throughout the site; that is, the subsurface conditions everywhere are not significantly different from those disclosed by the borings at the time they were completed. If, during construction, different subsurface conditions from those encountered in our borings are observed, or appear to be present in excavations, we must be advised promptly so that we can review these conditions and reconsider our recommendations where necessary. If there is a substantial lapse of time between submission of this report and the start of the work at the site, if conditions have changed due either to natural causes or to construction operations at or adjacent to the site, or if structure locations, structural loads or finish grades are changed, we urge that we be promptly informed and retained to review our report to determine the applicability of the conclusions and recommendations, considering the changed conditions and/or time lapse.

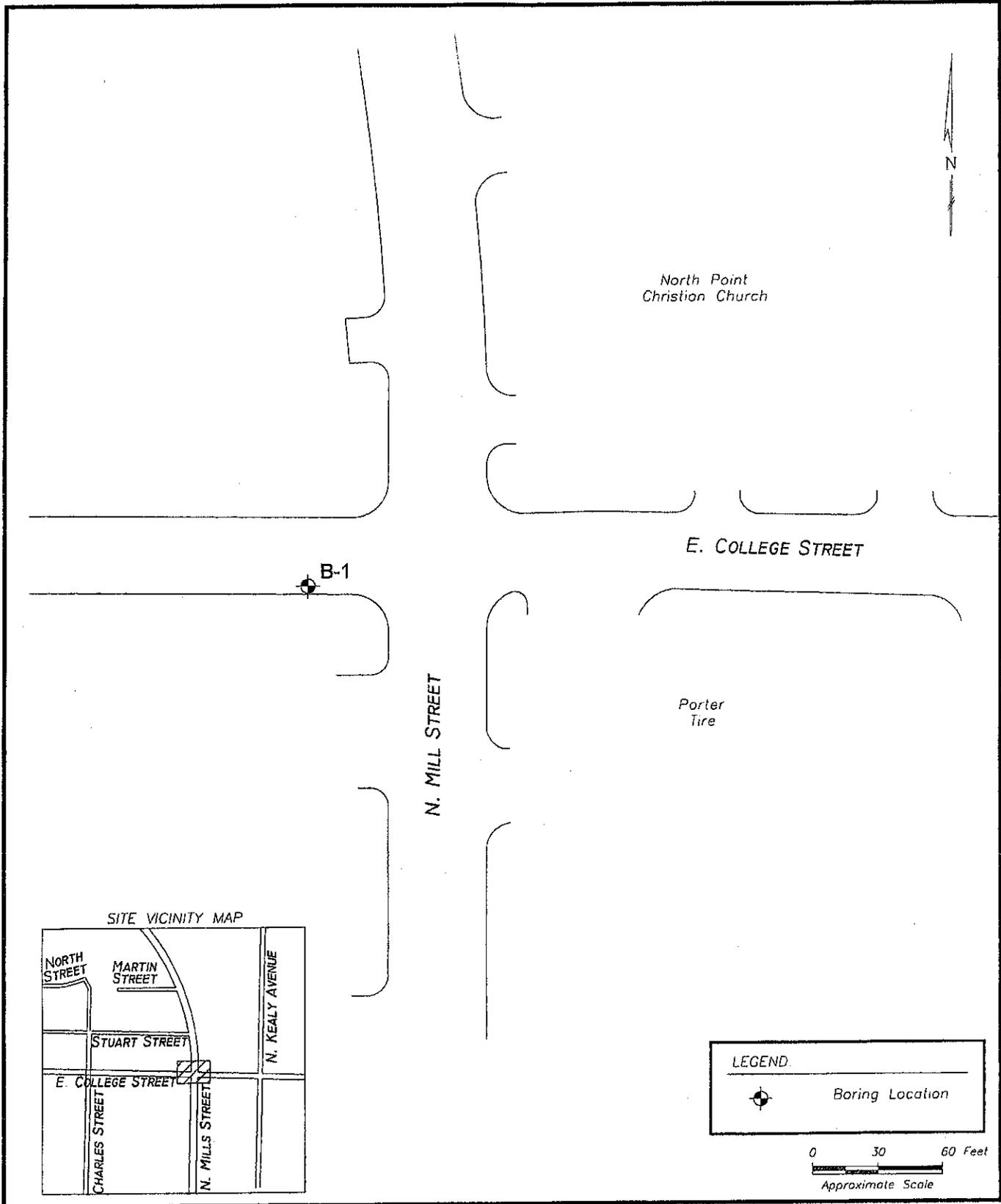
Further, it is urged that CMJ Engineering, Inc. be retained to review those portions of the plans and specifications for this particular project that pertain to earthwork and foundations as a means to determine whether the plans and specifications are consistent with the recommendations contained in this report. In addition, we are available to observe construction, particularly the compaction of structural fill, or backfill and the construction of foundations as recommended in the report, and such other field observations as might be necessary.

The scope of our services did not include any environmental assessment or investigation for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, ground water or air, on or below or around the site.

This report has been prepared for use in developing an overall design concept. Paragraphs, statements, test results, boring logs, diagrams, etc. should not be taken out of context, nor utilized without a knowledge and awareness of their intent within the overall concept of this report. The reproduction of this report, or any part thereof, supplied to persons other than the owner, should indicate that this study was made for design purposes only and that verification of the subsurface conditions for purposes of determining difficulty of excavation, trafficability, etc. are responsibilities of the contractor.

This report has been prepared for the exclusive use of Kimley-Horn & Associates, Inc. for specific application to design of this project. The only warranty made by us in connection with the services provided is that we have used that degree of care and skill ordinarily exercised under similar conditions by reputable members of our profession practicing in the same or similar locality. No other warranty, expressed or implied, is made or intended.

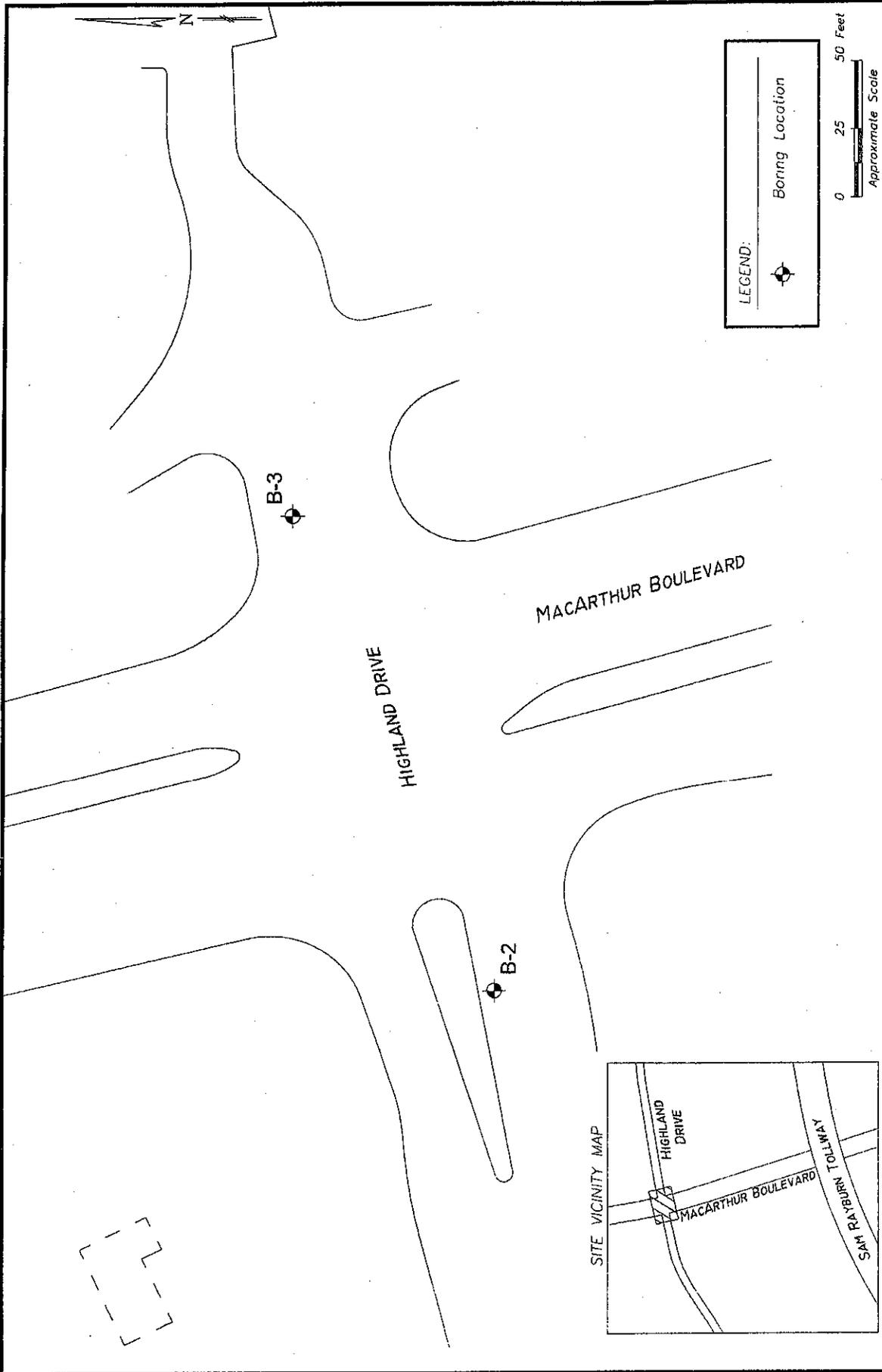
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CMJ ENGINEERING, INC.
 CMJ PROJECT No. 103-12-147

PLAN OF BORINGS
 INTERSECTION IMPROVEMENTS
 LEWISVILLE, TEXAS

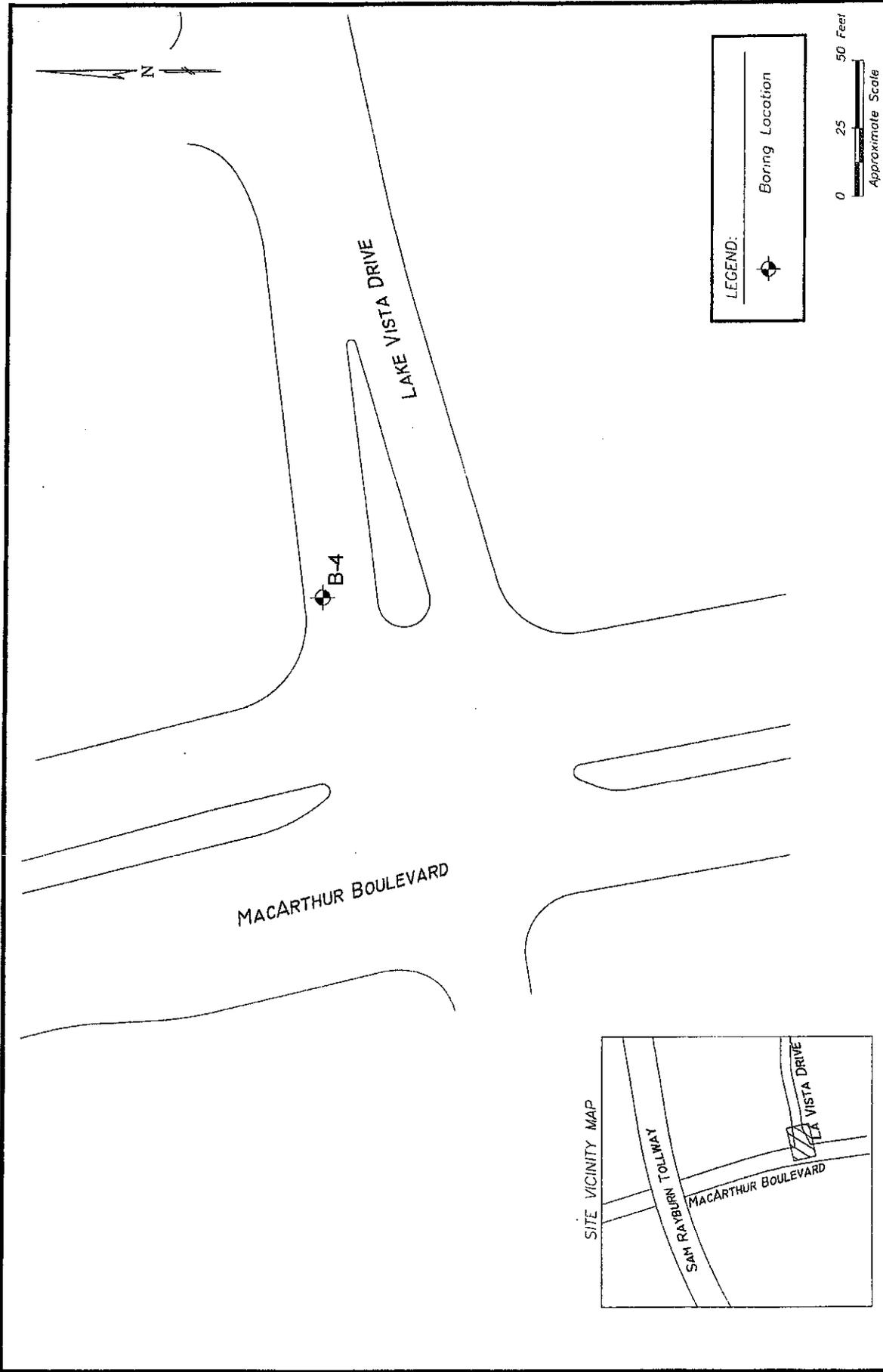
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A.1A



CMJ PROJECT No. 103-12-147

PLAN OF BORINGS
 INTERSECTION IMPROVEMENTS
 LEWISVILLE, TEXAS

PLATE
 A.1B




CMJ ENGINEERING, INC.
 CMJ PROJECT No. 103-12-147

PLAN OF BORINGS
 INTERSECTION IMPROVEMENTS
 LEWISVILLE, TEXAS

PLATE
 A.1c

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

UNIFIED SOIL CLASSIFICATION SYSTEM

PLATE A.2

SOIL OR ROCK TYPES											
	GRAVEL		LEAN CLAY		LIMESTONE						
	SAND		SANDY		SHALE						
	SILT		SILTY		SANDSTONE						
	CLAYEY		HIGHLY PLASTIC CLAY		CONGLOMERATE	Shelby Tube	Auger	Split Spoon	Rock Core	Cone Pen	No Recovery

TERMS DESCRIBING CONSISTENCY, CONDITION, AND STRUCTURE OF SOIL

Fine Grained Soils (More than 50% Passing No. 200 Sieve)

Descriptive Item	Penetrometer Reading, (tsf)
Soft	0.0 to 1.0
Firm	1.0 to 1.5
Stiff	1.5 to 3.0
Very Stiff	3.0 to 4.5
Hard	4.5+

Coarse Grained Soils (More than 50% Retained on No. 200 Sieve)

Penetration Resistance (blows/foot)	Descriptive Item	Relative Density
0 to 4	Very Loose	0 to 20%
4 to 10	Loose	20 to 40%
10 to 30	Medium Dense	40 to 70%
30 to 50	Dense	70 to 90%
Over 50	Very Dense	90 to 100%

Soil Structure

Calcareous	Contains appreciable deposits of calcium carbonate; generally nodular
Slickensided	Having inclined planes of weakness that are slick and glossy in appearance
Laminated	Composed of thin layers of varying color or texture
Fissured	Containing cracks, sometimes filled with fine sand or silt
Interbedded	Composed of alternate layers of different soil types, usually in approximately equal proportions

TERMS DESCRIBING PHYSICAL PROPERTIES OF ROCK

Hardness and Degree of Cementation

Very Soft or Plastic	Can be remolded in hand; corresponds in consistency up to very stiff in soils
Soft	Can be scratched with fingernail
Moderately Hard	Can be scratched easily with knife; cannot be scratched with fingernail
Hard	Difficult to scratch with knife
Very Hard	Cannot be scratched with knife
Poorly Cemented or Friable	Easily crumbled
Cemented	Bound together by chemically precipitated material; Quartz, calcite, dolomite, siderite, and iron oxide are common cementing materials.

Degree of Weathering

Unweathered	Rock in its natural state before being exposed to atmospheric agents
Slightly Weathered	Noted predominantly by color change with no disintegrated zones
Weathered	Complete color change with zones of slightly decomposed rock
Extremely Weathered	Complete color change with consistency, texture, and general appearance approaching soil

KEY TO CLASSIFICATION AND SYMBOLS PLATE A.3

Project No 103-12-147		Boring No. B-1		Project Intersection Improvements Lewisville, Texas											
Location See Plate A.1		Water Observations Dry during drilling; dry at completion													
Completion Depth 20.0'		Completion Date 1-2-13													
Surface Elevation		Type B-47, w/ CFA													
Depth, Ft.	Symbol	Samples	Stratum Description			REC %	RQD %	Blows/Ft. or Pen Reading, T.S.F.	Passing No 200 Sieve, %	Liquid Limit, %	Plastic Limit, %	Plasticity Index	Moisture Content, %	Unit Dry Wt. Lbs./Cu. Ft.	Unconfined Compression Pounds/Sq. Ft.
			CONCRETE , 6.5 inches thick SANDY CLAY , light brown and gray w/ ironstone nodules, stiff to very stiff					20	49	16	33	28	101		
5			-w/ calcareous nodules below 7'					4.25					19		
			CLAYEY SAND , light brown and gray w/ sand seams					4.25	39	13	26	14			
15			SHALY CLAY , light brown and gray, w/ calcareous nodules, slickensided, hard					1.5				16	117	1870	
20								4.5+				29	94	5580	

LOG OF BORING 103-12-147-GPJ CMJ.GDT 1/15/13

LOG OF BORING NO. **B-1**

PLATE A.4

Project No 103-12-147		Boring No. B-2		Project Intersection Improvements Lewisville, Texas											
Location See Plate A.1		Water Observations Dry during drilling; dry at completion													
Completion Depth 20.0'		Completion Date 1-2-13													
Surface Elevation		Type B-47, w/ CFA													
Depth, Ft.	Symbol	Samples	Stratum Description			REC %	RQD %	Blows/Ft. or Pen Reading, T.S.F.	Passing No 200 Sieve, %	Liquid Limit, %	Plastic Limit, %	Plasticity Index	Moisture Content, %	Unit Dry Wt. Lbs./Cu. Ft.	Unconfined Compression Pounds/Sq. Ft.
			BRICK PAVERS, 2.5 inches thick SAND, 2 inches thick CONCRETE, 9 inches thick CLAY, brown, stiff to very stiff -w/ Ironstone nodules below 3'					3 25	57	17	40	37	92		
								2 75				27			
								3.0				26			
								3.0				26			
								2 25				29			
								3.5				26			
			-grades light brown below 12'												
								2.75	70	23	47	26	96	3020	
								3.5				26			

LOG OF BORING 103-12-147.GPJ CMJ.GDT 1/15/13

LOG OF BORING NO. **B-2**

PLATE A.5

Project No 103-12-147		Boring No. B-4		Project Intersection Improvements Lewisville, Texas											
Location See Plate A.1		Water Observations Dry during drilling; dry at completion													
Completion Depth 8.0'		Completion Date 1-2-13													
Surface Elevation		Type B-47, w/ CFA													
Depth, Ft.	Symbol	Samples	Stratum Description			REC %	RQD %	Blows/Ft. or Pen Reading, T.S.F.	Passing No 200 Sieve, %	Liquid Limit, %	Plastic Limit, %	Plasticity Index	Moisture Content, %	Unit Dry Wt. Lbs./Cu. Ft.	Unconfined Compression Pounds/Sq. Ft.
			CONCRETE , 8.75 inches thick												
			CLAY , brown, stiff to very stiff -firm, 2' to 4'					4.0		68	22	46	34		
								1.25					36	87	
								1.0					33		
								2.75					28		
								2.25					30		

LOG OF BORING 103-12-147.GPJ CMJ.GDT 1/15/13

LOG OF BORING NO. **B-4**

PLATE A.7

SOLUBLE SULFATE TEST RESULTS

Project: Intersection Improvements
Lewisville, Texas

Project No.: 103-12-147

Boring No.	Depth (ft.)	Material	Soluble Sulfates (ppm)
B-1	1 - 2	Sandy Clay	<100
B-2	1 - 2	Clay	<100
B-4	1 - 2	Clay	<100

Note: Test Method TxDOT Tex 145-E.

LIME SERIES TEST RESULTS

Project: Intersection Improvements
Lewisville, Texas

Project No.: 103-12-147

Boring No.: B-1	Depth: 2' to 3'
Material: Sandy Clay	
Percent Lime	pH
0	9.22
2	12.53
4	12.62
6	12.67
8	12.70
10	12.74

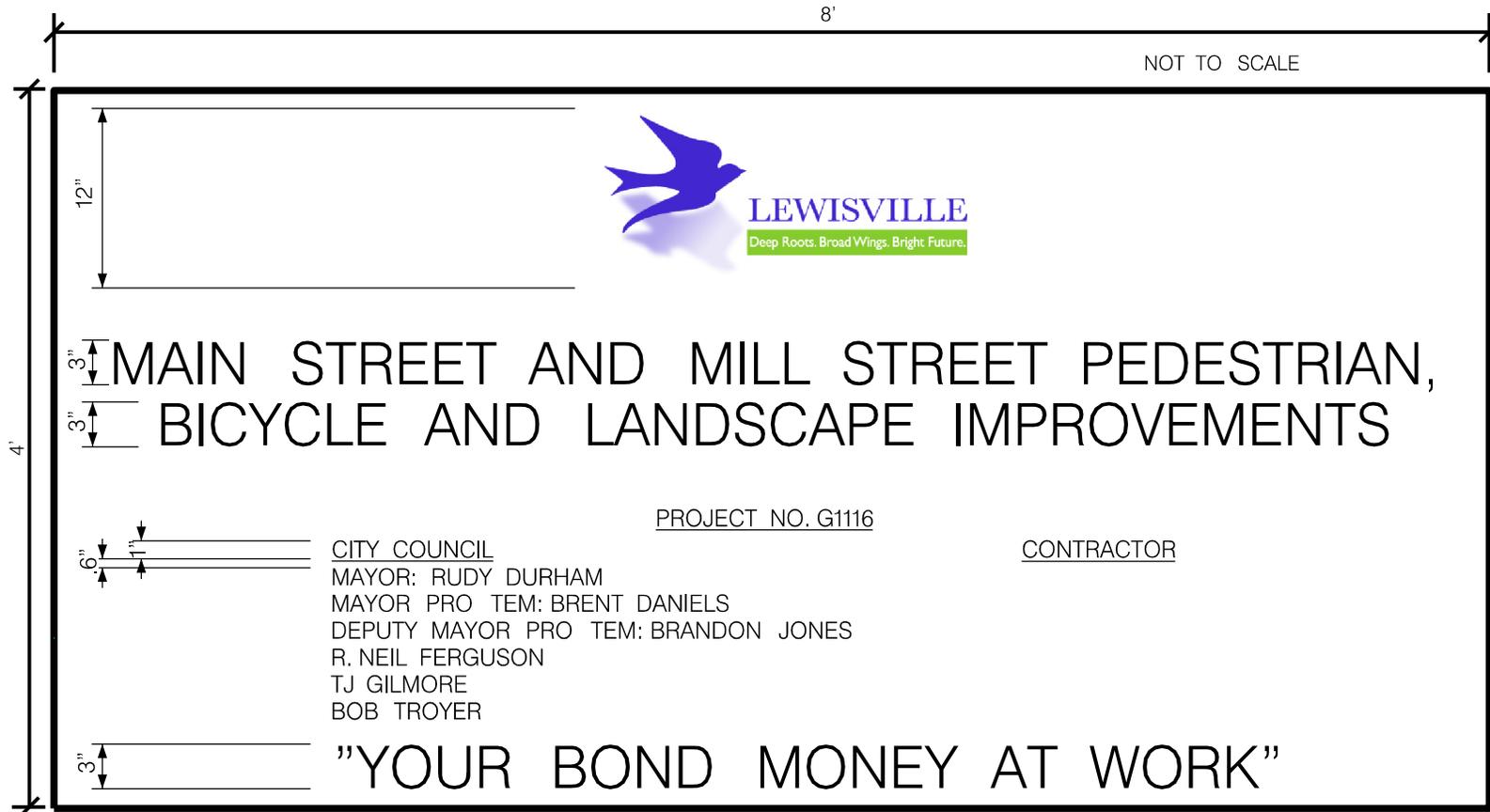
Boring No.: B-3	Depth: 1' to 2'
Material: Clay	
Percent Lime	pH
0	8.65
2	12.37
4	12.52
6	12.58
8	12.63
10	12.67

LIME SERIES TEST RESULTS (continued)

Project: Intersection Improvements
Lewisville, Texas

Project No.: 103-12-147

Boring No.: B-4	Depth: 1' to 2'
Material: Sandy Clay	
Percent Lime	pH
0	9.82
2	12.24
4	12.52
6	12.58
8	12.64
10	12.67



CITY OF LEWISVILLE, TEXAS

CONSTRUCTION AGREEMENT

Project: construction of Main Street, Mill Street and Charles Street Paving, Drainage, Landscape, and Signalization Improvements, Project No. G1116 (the "Project").

This Construction Agreement (the "Agreement") is made on this date, [MONTH] _____, 2018_, between the **City of Lewisville** (the "City") and _____ (the "Contractor").

1. Services. The Contractor shall commence and complete the construction of Main Street, Mill Street and Charles Street Paving, Drainage, Landscape, and Signalization Improvements (the "Services"), and all extra work in connection with the Services, under the terms as stated in the Specifications and Contract Documents for the Construction of Main Street, Mill Street and Charles Street Paving, Drainage, Landscape, and Signalization Improvements (the "Specifications"), attached hereto as **Exhibit A**, the Main Street, Mill Street and Charles Street Paving, Drainage, Landscape, and Signalization Improvements Final Plans (the "Plans"), attached hereto as **Exhibit B**, and this Agreement, and at the Contractor's own proper cost and expense to furnish all the materials, supplies, machinery, equipment, tools, superintendence, labor, insurance, and other accessories and services necessary to complete the Services, in accordance with the conditions and prices stated in the Contractor's Proposal (the "Proposal") attached hereto as **Exhibit C**, and in accordance with the Specifications (**Exhibit A**) and Plans (**Exhibit B**), as prepared by the City and attached hereto. The Contractor will perform all Services in a good and professional manner and in accordance with industry standards. The Contractor is responsible for constructing a final product that is fully functional and fit for its intended purposes, and meets all requirements set forth in the Agreement, the Specifications (**Exhibit A**), and the Plans (**Exhibit B**). The City will be the sole judge of the acceptability of all work and Services performed under this Agreement.

The City shall perform such services as outlined in the Specifications (**Exhibit A**), if any.

2. Completion of Services. The Contractor hereby agrees to commence work within ten (10) calendar days after the date of the written notice to commence work and to fully complete the same within 540 consecutive calendar days after the date of the written notice to commence work, subject to such extensions of time as are provided by the Specifications (**Exhibit A**).
3. Agreement Documents. The Agreement shall include the following documents, and this Agreement does hereby expressly incorporate same herein as if set forth verbatim in this Agreement:
 - A. This Agreement
 - B. The Specifications (**Exhibit A**) and the Plans (**Exhibit B**)

C. The Proposal (**Exhibit C**)

To the extent that any exhibit is in conflict with provisions of this Agreement or each other, the provisions of this Agreement, then the provisions of **Exhibit A** and **Exhibit B** jointly, then **Exhibit C** shall prevail in the order.

4. Confidential Information. To the extent allowed by law, the City will safeguard and keep from release any documents marked “proprietary” or information not generally available to the public. However, the City will, if required, comply with all requirements of the Texas Public Information Act with regard to any documents in its possession at the time of a request made under that Act.
5. Pricing. The City agrees to pay the Contractor in current funds the price or prices shown in the Proposal (**Exhibit C**).
6. Payment. Payments will be subject to the terms outlined in the Specifications (**Exhibit A**). The City shall remit payment within thirty (30) days after receipt of an invoice, in accordance with the Texas Prompt Payment Act (Tex. Gov’t Code Ch. 2251). All original invoices are to be sent to the City of Lewisville, Attention: AP Division, 151 West Church Street, Lewisville, Texas 75057 or P.O. Box 299002, 75029-9002.
7. Change Orders. Any changes to the Services that change the Agreement price or the Agreement time, as specified herein, must be authorized by the City in writing PRIOR to commencement of said work. Any work performed without the City’s prior written consent will be at the sole expense of the Contractor.
8. Subcontractors. If subcontractors are used, the subcontractor will be directed and supervised solely by the Contractor. The Contractor shall require the subcontractor to hold the same insurance as required of the Contractor under this Agreement.
9. Right of Inspection and Required Repairs. The City shall have the right to observe and check all ongoing work in sufficient detail to determine if the Services are proceeding satisfactorily. The City shall have the right to inspect all Services completed before accepting them and making payments in accordance with this Agreement. Should any portion of the completed Services fail to meet the requirements of the City, the Contractor shall repair or replace items failing to meet requirement until items can be demonstrated to comply.
10. Termination. This Agreement may be terminated by the City under the terms outlined in the Specifications (**Exhibit A**).
11. Insurance. During the period of this Agreement, the Contractor will maintain, at its expense, insurance with limits not less than those prescribed in the Specifications (**Exhibit A**). All insurance must be reviewed and approved by the City **prior to commencement of work**.

12. Bonds. The Contractor shall provide bonds as required by the Specifications (**Exhibit A**) **prior to commencement of work**.
13. Worker's Compensation. The Contractor shall abide by the workers compensation requirements outlined in the Specifications (**Exhibit A**).
14. Independent Contractor. Contractor shall be considered an independent contractor and not an agent, servant, employee, or representative of the City in the performance of the work and Services. No term or provision herein or act of the City shall be construed as changing that status.
15. Compliance with Laws. The Contractor shall comply with all applicable federal, state, and local statutes, regulations, ordinances, and other laws, including, but not limited to the Immigration Reform and Control Act (IRCA).
16. Governing Law and Venue. This Agreement is governed by the laws of the State of Texas. Exclusive venue for any dispute arising out of this Agreement is in Denton County, Texas.
17. Arbitration. In the event of a dispute which may arise under this Agreement, the City does not agree to arbitration.
18. Tax Exempt Status. The City is exempt from and shall not pay state and local sales and use taxes on labor and materials incorporated into the Project. If necessary, it is the responsibility of the Contractor to obtain from the State Comptroller's Office a sales tax permit, resale certificate, and exemption certificate that will enable the Contractor to buy any materials for the Services and then resell the aforementioned materials to the City without paying the tax on the materials at the time of purchase.
19. Entire Agreement. This Agreement and its exhibits contain the entire agreement of the parties with respect to the matter contained herein. All provisions of this Agreement shall be strictly complied with and conformed to by the Contractor, and no amendment to the Agreement shall be made except upon the written agreement of the parties, which shall not be construed to release either party from any obligation of the Agreement except as specifically provided for in such amendment.
20. Assignment. This Agreement may not be assigned except as provided for in the Specifications (**Exhibit A**).
21. Governmental Immunity. Unless otherwise required under the law, the Parties agree that the City has not waived its governmental immunity by entering into and performing their obligations under this Agreement.

22. Notice. Any notice provided or permitted to be given under this Agreement must be in writing and may be served by depositing same in the United States mail, addressed to the party to be notified, postage pre-paid and registered or certified with return receipt requested, or by delivering the same in person to such party via a hand-delivery service, Federal Express or any courier service that provides a return receipt showing the date of actual delivery of same, to the address thereof. Notice given in accordance herewith shall be effective upon receipt at the address of the addressee. For purposes of notification, the addresses of the parties shall be as follows:

If to Contractor, to: _____

If to City, to: City of Lewisville
Attn: Todd White, C.P.M.
151 W. Church Street
Lewisville, Texas 75057

23. Severability. In case any one or more of the provisions contained in this Agreement shall for any reason be held to be invalid, illegal, or unenforceable in any respect, such invalidity, illegality, or unenforceability shall not affect any other provision thereof, and this Agreement shall be construed as if such invalid, illegal, or unenforceable provision had never been contained herein.

24. Representations. Each signatory represents this Agreement has been read by the party for which this Agreement is executed and that such party has had an opportunity to confer with its counsel.

25. Miscellaneous Drafting Provisions. This Agreement shall be deemed drafted equally by all parties hereto. The language of all parts of this Agreement shall be construed as a whole according to its fair meaning, and any presumption or principle that the language herein is to be construed against any party shall not apply. Headings in this Agreement are for the convenience of the parties and are not intended to be used in construing this document.

26. Force Majeure. If by reason of Force Majeure, either party hereto shall be rendered unable wholly or in part to carry out its obligations under this Agreement then such party shall give notice and full particulars of Force Majeure in writing to the other party within a reasonable time after occurrence of the event or cause relied upon, and the obligation of the party giving such notice, so far as it is affected by such Force Majeure, shall be suspended during the continuance of the inability then claimed, except as hereinafter provided, but for no longer period, and such party shall endeavor to remove or overcome such inability with all reasonable dispatch. The term Force Majeure as employed herein, shall mean acts of God, strikes, lockouts, or other industrial disturbances, act of public enemy, order of any kind of government of the United States or the

State of Texas or any civil military authority, insurrections, riots, epidemics, landslides, lightning, earthquakes, fires, hurricanes, storms, floods, washouts, droughts, arrests, restraint of government and people, civil disturbances, explosions, breakage or accidents to machinery, pipelines or canals, or other causes not reasonably within the control of the party claiming such inability.

27. Waiver. No claim or right arising out of a breach of this Agreement can be discharged in whole or in part by a waiver or renunciation of the claim or right unless the waiver or renunciation is supported by consideration and is in writing signed by the aggrieved.
28. **INDEMNIFICATION**. **CONTRACTOR AGREES TO DEFEND, INDEMNIFY AND HOLD THE CITY, ITS OFFICERS, AGENTS AND EMPLOYEES, HARMLESS AGAINST ANY AND ALL CLAIMS, LAWSUITS, JUDGMENTS, COSTS AND EXPENSES FOR PERSONAL INJURY (INCLUDING DEATH), PROPERTY DAMAGE OR OTHER HARM FOR WHICH RECOVERY OF DAMAGES IS SOUGHT, SUFFERED BY ANY PERSON OR PERSONS, THAT MAY ARISE OUT OF OR BE OCCASIONED BY CONTRACTOR'S BREACH OF ANY OF THESE TERMS AND CONDITIONS OR BY ANY NEGLIGENT OR STRICTLY LIABLE ACT OR OMISSION, INTENTIONAL TORT, INTELLECTUAL PROPERTY INFRINGEMENT, OR FAILURE TO PAY A SUBCONTRACTOR OR SUPPLIER COMMITTED BY OF CONTRACTOR, ITS OFFICERS, AGENTS, EMPLOYEES OR SUBCONTRACTORS, IN THE PERFORMANCE OF THIS AGREEMENT; EXCEPT THAT THE INDEMNITY PROVIDED FOR IN THIS PARAGRAPH SHALL NOT APPLY TO ANY LIABILITY RESULTING FROM THE SOLE NEGLIGENCE OR FAULT OF THE CITY, ITS OFFICERS, AGENTS, EMPLOYEES OR SEPARATE CONTRACTORS, AND IN THE EVENT OF JOINT AND CONCURRING NEGLIGENCE OR FAULT OF THE CONTRACTOR AND THE CITY, RESPONSIBILITY AND INDEMNITY, IF ANY, SHALL BE APPORTIONED IN ACCORDANCE WITH THE LAW OF THE STATE OF TEXAS, WITHOUT WAIVING ANY GOVERNMENTAL IMMUNITY AVAILABLE TO THE CITY UNDER TEXAS LAW AND WITHOUT WAIVING ANY DEFENSES OF THE PARTIES UNDER TEXAS LAW AND THE CITY'S REASONABLE ATTORNEY'S FEES SHALL BE REIMBURSED IN PROPORTION TO THE CONTRACTOR'S LIABILITY. THE PROVISIONS OF THIS PARAGRAPH ARE SOLELY FOR THE BENEFIT OF THE PARTIES HERETO AND NOT INTENDED TO CREATE OR GRANT ANY RIGHTS, CONTRACTUAL OR OTHERWISE, TO ANY PERSON OR ENTITY. ANY INDEMNIFICATION AGREED TO BY THE CITY IS ONLY TO THE EXTENT ALLOWED BY LAW.**
29. Immigration Reform and Control Act (8 U.S.C. 1324a). The City of Lewisville supports the Immigration Reform and Control Act (IRCA) which is a comprehensive scheme prohibiting the employment of unauthorized aliens in the United States. The Contractor shall submit a declaration signed under penalty of perjury of the laws of the State of Texas stating that it has

not been found in violation of IRCA by the United States Attorney General or Secretary of Homeland Security in the preceding five (5) years. The Contractor shall ensure that its Subcontractors submit a declaration signed under penalty of perjury of the laws of the State of Texas stating that they have not been found in violation of IRCA by the United States Attorney General or Secretary of Homeland Security in the preceding five (5) years. The Contractor and its Subcontractors shall at all times during the term of the contract with the City comply with the requirements of IRCA and shall notify the City within fifteen (15) working days of receiving notice of a violation of IRCA. The City may terminate a contract with the Contractor if the City determines that (a) the Contractor or its Subcontractors have been untruthful regarding IRCA violations in the preceding five (5) years; (b) if the Contractor fails to ensure that its Subcontractors submit the aforementioned declaration; or (c) the Contractor or its Subcontractors fail to timely notify the City of an IRCA violation.

30. ADA Compliance. All goods and services provided to the City must be compliant with the Americans with Disabilities Act and any amendments thereto (the “ADA”) and all regulations promulgated pursuant to the ADA. Contractor will be required to certify compliance, if required under the law or otherwise required by the City.
31. Protection of Resident Workers. The City actively supports the Immigration and Nationality Act (INA), which includes provisions addressing employment eligibility, employment verification, and nondiscrimination. Under the INA, employers may hire only persons who may legally work in the United States (i.e., citizens and nationals of the U.S.) and aliens authorized to work in the U.S. The employer must verify the identity and employment eligibility of anyone to be hired, which includes completing the Employment Eligibility Verification Form (I-9) for every worker performing services under the Agreement. be hired, which includes completing the Employment Eligibility Verification Form (I-9). The Contractor and its Subcontractors shall establish appropriate procedures and controls so no services or products under the Contract Documents will be performed or manufactured by any worker who is not legally eligible to perform such services or employment. The City reserves the right to audit Contractor’s or Subcontractor’s employment records to verify the existence of a completed Employment Eligibility Verification Form (I-9) for every worker performing services or manufacturing products under the Contract Documents. The audit will be at the City’s expense.
32. Advertising. Contractor shall not advertise or publish, without the City’s prior consent, the fact that the Contractor has entered into this Agreement, except to the extent necessary to comply with proper requests for information from an authorized representative of the federal, state or local government.
33. Disclosure. Pursuant to Chapter 176 of the Texas Local Government Code, a person or agent of a person who contracts or seeks to contract with the City of Lewisville must complete a conflict of interest questionnaire if the person or agent has an affiliation or business relationship that might cause a conflict of interest with the City. The conflict of interest questionnaire, which is

available online at ethics.state.tx.us, must be filed with the City Secretary of the City of Lewisville no later than the seventh business day after the person or agent begins contract discussions or negotiations with the City of Lewisville or submits to the City of Lewisville an application, response to a request for proposal or bid, correspondence, or another writing related to a potential agreement with the City of Lewisville. An updated conflict of interest questionnaire must be filed in accordance with Chapter 176 of the Local Government Code. An offense under Chapter 176 is a Class C misdemeanor.

Contractor should consult with legal counsel if you have questions regarding its compliance with the requirements of Chapter 176. It is the responsibility of each person or agent who is contracting or seeking to contract with the City of Lewisville to comply with the filing requirement of Chapter 176.

34. Texas Government Code Chapter 2270. Pursuant to Texas Government Code Chapter 2270, Contractor affirms that execution of this Agreement serves as written verification that Contractor: (1) does not boycott Israel, as defined by Texas Government Code Section 808.001; and (2) will not boycott Israel during the term of the Agreement.
35. Texas Government Code Chapter 2252. Pursuant to Texas Government Code Chapter 2252, Subchapter F, Contractor affirms, by entering into this Agreement, that is it not identified on a list created by the Texas Comptroller of Public Accounts as a company known to have contracts with or provide supplies or services to Iran, Sudan, or a foreign terrorist organization.

(SIGNATURES ON FOLLOWING PAGE)

IN WITNESS, WHEREOF, we, the contracting parties, by our duly authorized agents, hereto affix our signatures as of the date listed above.

CITY OF LEWISVILLE, TEXAS
Approved by the Lewisville City
Council _____

CONTRACTOR:
[CONTRACTOR NAME]

By: _____
Donna Barron, City Manager

By: _____

Date: _____

Date: _____

[ADDRESS]

Telephone Number

E-mail Address

Federal Tax ID Number

Attest: _____
Julie Worster

Attest: _____

CITY OF LEWISVILLE
151 West Church Street
Lewisville, Texas 75057

APPROVED AS TO FORM:

Lizbeth Plaster, City Attorney

PROPOSED SUBCONTRACT BREAKDOWN

1.	Subcontractor	_____
	Address	_____
	Phone #	_____
	Description of Work	_____
2.	Subcontractor	_____
	Address	_____
	Phone #	_____
	Description of Work	_____
3.	Subcontractor	_____
	Address	_____
	Phone #	_____
	Description of Work	_____
4.	Subcontractor	_____
	Address	_____
	Phone #	_____
	Description of Work	_____

Reference is made to Item 21 on Page SS-10.

LIST OF SUPPLIERS

1.	Item Supplied	_____
	Supplier	_____
	Address	_____
	Phone #	_____
2.	Item Supplied	_____
	Supplier	_____
	Address	_____
	Phone #	_____
3.	Item Supplied	_____
	Supplier	_____
	Address	_____
	Phone #	_____
4.	Item Supplied	_____
	Supplier	_____
	Address	_____
	Phone #	_____

The undersigned Bidder agrees to execute the Agreement and furnish the required Performance Bond and Payment Bond within fifteen calendar days from the date of award of a contract by the City; and agrees that any delay in furnishing the signed Agreement and Bonds will result in liquidated damages being applied in accordance with Item 108.8.1. of the Standard Specifications.

The undersigned Bidder has attached and made a part of this Proposal a bid security in conformance with Item 102.5. of the Standard Specifications and in accordance with the Notice to Bidders.

Submitted:

(Signature)

(Name - Typed or Printed)

(Title)

(Seal, if corporation)

(Firm Name)

(Address)

(City/County/State/Zip Code)

(Telephone Number/Include Area Code)

(Date)

(Attest)

BOND REQUIREMENTS and RETAINAGE

BONDS

The successful bidder will be required to furnish the following bonds from a surety licensed to do business in the State of Texas. These bonds, along with proper insurance papers, will be incorporated as part of the final contract documents and will remain in effect until the completion and acceptance of the project. Maintenance bonds shall be in effect based on their stated term after final acceptance of the project:

Project amount \$10,001 to \$24,999 – a payment bond at the project amount and a maintenance bond for one year from the date of final payment.

Project amount \$25,000 to \$99,999 – a payment bond at the project amount and a maintenance bond for two years from the date of the final payment.

Project amount \$100,000 and greater – **a bid bond equal to 5% of the project amount is to be included with the sealed bid;** a payment bond and performance bond at the project amount and a maintenance bond for two years from the date of the final payment.

RETAINAGE

Retainage will be based on the following: 15 percent retainage for contracts up to \$25,000; 10 percent retainage for contracts in excess of \$25,000 and less than \$400,000; 5 percent retainage for contracts in excess of \$400,000.

PERFORMANCE BOND

**STATE OF TEXAS
COUNTY OF DENTON**

KNOW ALL MEN BY THESE PRESENTS: That _____ of the City of _____, County of _____, and State of _____, as Principal, and _____ authorized under the laws of the State of Texas to act as Surety on bonds for Principal, are held and firmly bound unto the City of Lewisville (Owner), in the penal sum of _____ Dollars (\$ _____) for the payment whereof, the said Principal and Surety bind themselves, and their heirs, administrators, executors, successors and assigns, jointly and severally, by these presents:

WHEREAS, the Principal has entered into a certain written contract (Contract) with the Owner, dated the ____ day of _____, 20____ to construct:

**Main Street, Mill Street and Charles Street Paving, Drainage,
Landscape and Signalization Improvements
PROJECT NO. G1116**

which Contract is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said Principal shall faithfully perform said Contract and shall in all respects duly and faithfully observe and perform all and singular the covenants, conditions and agreements in and by said Contract agreed and covenanted by the Principal to be observed and performed, and according to the true intent and meaning of said Contract and the Plans and Specifications hereto annexed, then this obligation shall be void; otherwise to remain in full force and effect;

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Chapter 2253 of the Texas Government Code as amended and all liabilities on this bond shall be determined in accordance with the provisions of said Chapter to the same extent as if it were copied at length herein.

Surety, for value received, stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract, or to the work performed thereunder, or the plans, specifications, or drawings accompanying the same, shall in anyway affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract, or to the work to be performed thereunder.

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IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument this _____ day of _____, 20__.

Principal

Surety

By:

By

Title:

Title

Address:

Address:

The name and address of the Resident Agent of Surety is:

Bond Number _____

PAYMENT BOND**STATE OF TEXAS
COUNTY OF DENTON**

KNOW ALL MEN BY THESE PRESENTS: That _____ of the City of _____, County of _____, and State of _____, as Principal, and _____ authorized under the laws of the State of Texas to act as Surety on bonds for Principal, are held and firmly bound unto the City of Lewisville (Owner), in the penal sum of _____ Dollars (\$_____) for the payment whereof, the said Principal and Surety bind themselves and their heirs, administrators, executors, successors and assigns, jointly and severally, by these presents:

WHEREAS, the Principal has entered into a certain written contract (Contract) with the Owner, dated the _____ day of _____, 20__ to construct:

**Main Street, Mill Street and Charles Street Paving, Drainage,
Landscape and Signalization Improvements
PROJECT NO. G1116**

which Contract is hereby referred to and made a part hereof as fully and to the same extent as if copied at length herein.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION IS SUCH, that if the said Principal shall pay all claimants supplying labor and material to him or a subcontractor in the prosecution of the work provided for in said Contract, then, this obligation shall be void; otherwise to remain in full force and effect;

PROVIDED, HOWEVER, that this bond is executed pursuant to the provisions of Chapter 2253 of the Texas Government Code as amended and all liabilities on this bond shall be determined in accordance with the provisions of said Chapter to the same extent as if it were copied at length herein.

Surety, for value received, stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract, or to the work performed thereunder, or the plans, specifications or drawings accompanying the same, shall in anyway affect its obligation on this bond, and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract, or to the work to be performed thereunder.

IN WITNESS WHEREOF, the said Principal and Surety have signed and sealed this instrument this _____ day of _____, 20__.

Principal

Surety

By:

By

Title:

Title

Address:

Address:

The name and address of the Resident Agent of Surety is:

MAINTENANCE BOND**Bond No.** _____**KNOW ALL MEN BY THESE PRESENTS:**

That we, _____
 (hereinafter called **Principal**), and _____, a corporation
 organized under the laws of the State of _____ and authorized to do a surety business in the State
 of Texas, (hereinafter called **Surety**), are held and firmly bound unto the City of Lewisville, Texas
 (hereinafter called the **City**) in the full and just sum of _____,
 lawful money of the United States of America, for the payment of which sum, well and truly to be made,
 we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly
 by these presents.

WHEREAS, said **Principal** has performed _____
improvements, which have been or are about to be completed and accepted by the **City** for the project
 known as:

**Main Street, Mill Street and Charles Street Paving, Drainage,
 Landscape and Signalization Improvements
 PROJECT NO. G1116**

AND WHEREAS, it is required that the **Principal** should guarantee the project from defects caused
 by faulty or defective materials, workmanship, or design for a period of two years from and after the date
 of acceptance of the completed project by the **City**.

NOW, THEREFORE, if the **Principal** shall for a period of two years from and after the date of
 acceptance of the completed project by the **City** replace any and all defects arising in said work whether
 resulting from faulty or defective materials, workmanship, or design, then the above obligation shall be null
 and void; otherwise the obligation shall remain in full force and effect for two years from the date of
 acceptance of the completed project by the **City**.

The **City** shall notify the **Principal** in writing of any defects for which the **Principal** is responsible
 and shall specify in said notice a reasonable time within which the **Principal** shall have to correct said

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defects. If the **Principal** fails to correct said defects within the time specified in said notice, the **City**, in its discretion, may permit the **Surety** to correct said defects. If the **City** allows the **Surety** to correct said defects, the **Surety** shall have sixty (60) days thereafter within which to take such action as it deems necessary to insure performance of the **Principal's** obligation.

If such defects are not corrected after the time period specified in the notice or after the expiration of the sixty (60) day time period, whichever is applicable, the **City** shall have the right to correct the defects, and the **Principal** and **Surety**, jointly and severally, shall pay all costs and expenses incurred by the **City** in correcting the defects, including, but not limited to, the engineer, legal and other costs, together with any damages either direct or consequential, which the **City** sustains, or may sustain, on account of the **Principal's** failure to correct the defects. In addition, the **City** shall have the right to contract for the correction of said defects and, upon acceptance of a bid in accordance with the **City's** normal bidding process, the **Principal** and **Surety** shall become immediately liable for the amount of the bid. In the event that the **City** commences legal proceedings for the collection thereof, interest shall accrue on said amount at the rate of six (6) percent per annum, beginning at the commencement of said legal proceedings.

If the City commences suit for collection of any sums due hereunder, the **Principal** and **Surety**, jointly and severally, agree to pay all costs and expenses incurred by the **City**, including, but not limited to, attorney's fees.

IN WITNESS WHEREOF, the parties have caused this instrument to be signed and sealed by their respective authorized officers this _____ day of _____ 20__.

Principal: _____

Surety: _____

By: _____

By: _____

_____, *Attorney-in-Fact*

Address: _____

Address: _____

Witness as to Principal

ALL BIDDERS ARE NOTIFIED THAT THE FOLLOWING QUALIFICATION STATEMENT MUST BE COMPLETED AND SUBMITTED WITH THE BID PROPOSAL.

Contractor's Qualifications

The contractor shall show that he has experience with similar projects that require working in confined areas in close proximity to many physical features (fences, utility poles, gas lines, gas lines and meters, sewer manholes and cleanouts, etc.) which requires the contractor to plan work efforts and equipment needs with these limitations in mind. The contractor shall submit a list of Public Works Projects successfully completed within the last three (3) years. This list shall include the names of supervisors and type of equipment used to perform this work.

BIDDER'S QUALIFICATION STATEMENT

Project:

Contractor:

Indicate One: Sole Proprietor Partnership Other
 Corporation Joint Venture

Name:

Title:

Address:

City:

State & Zip:

Phone:

State and Date of Incorporation, Partnership, Ownership, Etc.

Location of Principal Office:

Contact and Phone at Principal Office:

Liability Insurance Provided and Limits of Coverage:

Workers Compensation Insurance Provider:

Surety Bonding Company (Performance & Payment):

Insurance Agency Name:

Insurance Agency Address:

Contact Person:

Phone Number:

Total Number of Employees to be Associated with this Job:

<input type="text"/> Managerial	<input type="text"/> Administrative	<input type="text"/> Professional
<input type="text"/> Skilled	<input type="text"/> Semi-Skilled	<input type="text"/> Other

Percentage of Work to be Done by Bidder's Employees (Based on Dollars Bid):

Type(s) of Work to be Done by Bidder's Employees (Examples: Concrete Paving, Structural Concrete, Water Lines, Sanitary Sewer Lines, Storm Pipe, Storm Inlets, Excavation, Lime, Bridge Fencing, etc.)

	5
	6

Access to Tools and Equipment:

Percent Owned Percent Rented

Number of Years in Business as a Contractor on Above Types of Work:

Type(s) of Work to be Done by Sub-Contractors:

Include Name, Address, and Phone Number of Sub-Contractor. (Use Additional Sheets, if needed.)

Type of Work

Sub-Contractor

List your most current completed projects, with information, similar to the type of work bid. (Use Additional Sheets, if necessary.)

Project:

Project Description:

Owner/Agency:

Year Built:

Contract Price:

Contact Person:

Phone:

Project:

Project Description:

Owner/Agency:

Year Built:

Contract Price:

Contact Person:

Phone:

Project:



Project Description:

Owner/Agency:

Year Built:

Contract Price:

Contact Person:

Phone:

Project:

Project Description:

Owner/Agency:

Year Built:

Contract Price:

Contact Person:

Phone:

Project:

Project Description:

Owner/Agency:

Year Built:

Contract Price:

Contact Person:

Phone:

Project:

Project Description:

Owner/Agency:

Year Built:

Contract Price:

Contact Person:

Phone:

Trade References (List Company, Address, Contact Person, and Phone):

	5
	6

Bank References (List Institution, Address, Contact Person, and Phone):

	5
	6

Claims and Suits (If the answer to any of the questions is yes, please attach details):

Has your organization ever failed to complete any work awarded to it?

	5
	6

Are there any judgments, claims, arbitration proceedings, or suits pending or outstanding against your organization or its officers?

	5
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Has your organization filed any lawsuits or requested arbitration with regard to construction contracts within the last five years?

--

Within the last five years, has any officer or principal of your organization ever been an officer or principal of another organization when it failed to complete a construction contract?

--

CITY OF LEWISVILLE PURCHASING DIVISION

INSTRUCTIONS TO BIDDERS

INSTRUCTIONS: These instructions apply to all bids and become a part of the terms and conditions of any bid submitted.

BIDS must not be faxed but are to be submitted to the City in **one** of the following manners:

A. **Electronic Receipt:** Bidders are encouraged to submit bids to the City through Bidsync.com. The City is a member of this internet service and the submittal of bids to the City is at no cost to the bidder. The internet site is www.bidsync.com.

or

B. **Paper Bid Receipt:** Paper bids may be submitted to the City. Bidders are to submit the original and one copy of their bid in a sealed envelope to the Purchasing Division prior to response due date/time. The sealed envelope is to be marked on the outside with the Bidder's name, address, the bid invitation number and closing date recorded on the bottom left corner of the envelope.

Address to:

City of Lewisville
Purchasing Division
P.O. Box 299002
Lewisville, Texas 75029-9002

Sealed bids may be delivered in person or by courier to the Purchasing Division on the First Floor of City Hall, 151 Church Street, Lewisville, Texas 75057.

Sealed bids must be returned in sufficient time as to be received and time stamped at the above location on or before the published bid date and time shown on the bid invitation. Bids received after submission deadline shall be returned unopened and will be considered void and unacceptable. The City of Lewisville is not responsible for lateness of mail carrier, etc.

BID: The bidder should quote its lowest and best price, F.O.B. destination on each item bid. If delivery and shipping quantities affect unit bid price, multiple bids may be made so as to indicate "price break" quantities in order for the City to determine maximum economic benefits. Pricing for paper bids shall be entered on the Bid Sheet in ink or typewritten. Totals shall be entered in the "Total Price" column of the Bid Sheet. In all cases of discrepancy between unit price and extended price, the unit price will be presumed to be correct.

MAKE-MODEL Items must be the best and latest model available of the type specified. If the bid invitation indicates a specific brand of product, the brand listed is deemed to be descriptive and not restrictive, and is used to indicate the type and quality level desired for comparison purposes. Bidders may offer an approved equal to the brand listed, unless otherwise noted. The City shall make the final determination as to the brand offered being an approved equal to the brand listed. A Complete catalog or brochure showing in detail the item offered must accompany the bid.

SPLIT-AWARD: Bidders may furnish pricing for all or any portion of the bid invitation. Unless the bidder specifies otherwise in his bid, the City may award the contract for any item or group of items shown on the bid invitation.

BID FORMS: Bids submitted on other than City forms, whether electronic or paper, or with different terms or provisions may not be considered as responsive bids.

Bids must be held firm for ninety (90) days to allow for evaluation unless otherwise noted in the bid document.

F.O.B./DAMAGE: Quotations shall be bid F.O.B. Inside Delivery, Municipal Facility, Lewisville, Texas, and shall include all delivery and packaging costs. The City of Lewisville assumes no liability for goods delivered in damaged or unacceptable condition. The successful bidder shall handle all claims with carriers, and in case of damaged goods, shall ship replacement goods immediately upon notification by the City of damage.

INVOICES: Invoices must be submitted by the successful bidder in duplicate to the City of Lewisville Accounts Payable, P O Box 299002, Lewisville, TX 75029-9002.

TAXES: The City of Lewisville is exempt from Federal Manufacturer's Excise, and State Sales taxes. TAX MUST NOT BE INCLUDED IN BID. Tax exemption certificates will be executed by the City and furnished upon request.

PRICING: Bids should be firm. If the bidder, however, believes it necessary to base its price on price adjustment, such a bid may be considered, but only as an alternate bid.

PAYMENT TERMS: Payment terms are net 30 days after the goods are provided or services are completed, as required, or a correct invoice is received, whichever is later.

DELIVERY PROMISE - PENALTIES: Bids MUST show the number of calendar days required to place the materials in the possession of the City. DO NOT quote shipping dates. Consistent failure of a bidder to meet his delivery promises without valid reason may be cause for removal from the Bidder's List. When Delivery delays can be foreseen, the bidder shall give prior notice to the Purchasing Division which shall have the right to extend the delivery due date if reasons for delay appear acceptable. Default in promised delivery, without acceptable reasons, or failure to meet specifications, authorizes the Purchasing Division to purchase the goods elsewhere, and charge any increase in cost and handling to the defaulting bidder.

PACKAGING: Unless otherwise indicated, items will be new, unused, and in first class condition in containers suitable for damage-free delivery and storage.

CORRESPONDENCE: The bid number must appear on ALL correspondence, inquiries, etc. pertaining to the bid.

DELIVERY TIMES: Deliveries will be acceptable only during normal working hours at the designated City Municipal Facility.

PATENT RIGHTS: The Vendor agrees to indemnify and hold the City harmless from any and all claims involving patent right infringement or copyrights on goods supplied.

EVALUATION: Response to the specification in this bid is of primary importance in determining the lowest responsible bid.

BID AWARD: Bids will be awarded either on Lowest Responsible Bid or Best Value. The Criteria used to determine Best Value is as follows:

Purchase Price

The reputation of the bidder and of the bidder's goods and service

The quality of the bidder's goods or services

The extent to which the goods or services meet the municipality's needs.

The bidder's past relationship with the municipality.

The impact on the ability of the city to comply with laws and rules relating to contracting with historically underutilized businesses and non-profit organizations employing persons with disabilities.

The total long-term cost to the city to acquire the bidders good or services (Life Cycle Costing).

Any other relevant factors that a private business would consider in selecting a bidder.

FUNDING: The City of Lewisville is a home-rule municipal government operated and funded on an October 1 to September 30 Fiscal Year; accordingly, the City reserves the right to terminate, without liability to the City any contract for which funding is not available.

RESERVATIONS: The City expressly reserves the right to:

- A. Waive as an informality, minor deviations from specifications.
- B. Waive any defect, irregularity or informality in any bid or bidding procedure.
- C. Reject or cancel any or all bids.
- D. Reissue a bid invitation.
- E. Extend the bid opening time and date.
- F. Procure any item by other means.
- G. Increase or decrease the quantity specified in the bid invitation, unless the Bidder specifies otherwise.
- H. Consider and accept an alternate bid as provided herein when most advantageous to the City.

ASSIGNMENT: The successful bidder shall not sell, assign, transfer or convey this contract in whole or in part, without the prior written consent of the City.

AUDIT: The City of Lewisville reserves the right to audit the records and performance of the successful bidder during the term of the contract and for three years after the contract is completed.

PROTESTS: All protests regarding the bid solicitation process must be submitted in writing to the City Purchasing Manager within five (5) working days following the opening of bids. This includes all protests relating to advertising of bid notices, deadlines, bid opening, and all other related procedures under the Local Government Code, as well as any protests relating to alleged improprieties with the bidding process. This limitation does not include protests relating to staff recommendations as to award of this bid. Protests relating to staff recommendations may be directed to the City Council by contacting the City Secretary.

Failure to Protest within the time allotted shall constitute a waiver of any protest.

ALTERING BIDS: Bid cannot be altered or amended after submission deadline. Any interlineation, or alteration made before opening time for sealed bids must be initialed by the signer of the bid, guaranteeing authenticity.

CHANGE ORDERS: No oral statement of any person shall modify or otherwise change, or affect the terms, conditions or specifications stated in the resulting contract. All change orders to the contract will be made in writing by the City of Lewisville.

ADDENDA: Any interpretations, corrections or changes to this Invitation for Bid and Specifications will be made by ADDENDA. Sole authority to issue addenda shall be vested in the City of Lewisville. Bidders shall acknowledge receipt of all addenda on bid form.

MINIMUM STANDARDS FOR RESPONSIBLE PROSPECTIVE BIDDERS: A prospective bidder must affirmatively demonstrate bidder's responsibility. A prospective bidder must meet the following requirements:

Have adequate financial resources, or the ability to obtain such resources as required;

Be able to comply with the required or proposed delivery schedule;

Have a satisfactory record of performance;

Have a satisfactory record of integrity and ethics;

Be otherwise qualified and eligible to receive an award; and

The City of Lewisville may request representation and other information sufficient to determine bidder's ability to meet these minimum standards listed above.

BIDDER SHALL PROVIDE with this bid response, all documentation required. Failure to provide this information may result in rejection of bid.

SUCCESSFUL BIDDER SHALL defend, indemnify and save harmless the City of Lewisville and all its officers, agents and employees and all entities, their officers, agents and employees who are participating in this contract from all suits, actions, or other claims of any character, name and description brought for or on account of any injuries or damages received or sustained by any person, persons, or property on account of any negligent act or fault of the successful bidder, or of any agent, employee, subcontractor or supplier in the execution of, or performance under, any contract which may result from bid award. Successful bidder shall pay any judgment with cost which may be obtained against the City of Lewisville and participating entities growing out of such injury or damages.

TERMINATION FOR DEFAULT: The City of Lewisville reserves the right to enforce the performance of this contract in any manner prescribed by law or deemed to be in the best interest of the City in the event of breach or default of this contract. The City reserves the right to terminate the contract immediately in the event the successful bidder fails to 1) meet delivery schedules, or 2) otherwise perform in accordance with these specifications. Breach of contract or default authorizes the City to award to another bidder. Purchase elsewhere and charge the full increase in cost and handling to the defaulting successful bidder.

TESTING: Testing may be performed at the request of the City without expense to the City.

REMEDIES: The successful bidder and City of Lewisville agree that each party have all rights, duties, and remedies available as stated in the Uniform Commercial Code.

VENUE: This agreement will be governed and construed according to the laws of the State of Texas. This agreement is performable in Denton County, Texas.

SILENCE OF SPECIFICATION: The apparent silence of these specifications as to any detail or to the omission from it of a detailed description concerning any point shall be regarded as meaning that only the best commercial products and practices are to prevail. All interpretations of the specifications in this bid shall be made on the basis of this statement.

DEVIATIONS from specifications and alternate bids must be clearly shown on the bid form with complete information attached to form. They may or may not be considered.

NO EMPLOYEE of the City of Lewisville who has a financial interest in a prospective vendor shall participate in submitting a bid or proposal to conduct work for the City.

NO EMPLOYEE of the City of Lewisville shall receive any compensation for or as a result of a contract for goods or services purchased by the City if that employee was in a position to influence the City with respect to the contract.

ELIGIBLE BIDDER: Bidders are limited to those persons or firms who are qualified and engaged in a full-time business and can assume liabilities for any performance or warranty service required.

REJECTED ITEM(S): Item(s) that are rejected for failure to meet prescribed minimum specifications shall be returned to the supplier at no cost to the City of Lewisville.

INDEMNITY: The City of Lewisville will not accept a contract that contains any provision causing the City of Lewisville to indemnify the vendor for any reason.

VENDOR AGREEMENT: Any vendor agreements (service, maintenance, etc.) to be signed by the City of Lewisville must be submitted with your bid.

STATE RECIPROCAL REQUIREMENT

The City of Lewisville, as a governmental agency of the State of Texas, may not award a contract for general construction, improvements, services or public works projects or purchases of supplies, materials, or equipment to a non-resident bidder unless the non-resident's bid is lower than the lowest bid submitted by a responsible Texas resident bidder by the same amount that a Texas resident bidder would be required to underbid a non-resident bidder to obtain a comparable contract in the state in which the non-resident's principal place of business is located (Section 2252.002 of the Government Code). Bidder shall answer all the following questions by encircling the appropriate response or completing the blank provided.

- 1. Where is your principal place of business?
- 2. Only if your principal place of business is not in the state of Texas, please indicate:
 - A. In which state is your principal place of business located?
 - B. Does that state favor resident bidders (bidders in your state) by some dollar increment or percentage? YES NO
 - C. If "YES", what is that dollar increment or percentage?

NON-COLLUSION STATEMENT

The undersigned affirms that they are duly authorized to execute this contract, that this company, corporation, firms, partnership or individual has not prepared this bid in collusion with any other Bidder, and that the contents of this bid as to prices, terms or conditions of said bid have not been communicated by the undersigned nor by any employer or agent to any other person engaged in this type of business prior to the official opening of this bid.

Vendor:	<input style="width: 95%; height: 15px;" type="text"/>
Address:	<input style="width: 95%; height: 15px;" type="text"/>
City, State, Zip:	<input style="width: 95%; height: 15px;" type="text"/>
Phone	<input style="width: 95%; height: 15px;" type="text"/>
Email Address:	<input style="width: 95%; height: 15px;" type="text"/>
Bidder (Print name)	<input style="width: 95%; height: 15px;" type="text"/>
Bidder Signature	<input style="width: 95%; height: 15px;" type="text"/>
Position with Company	<input style="width: 95%; height: 15px;" type="text"/>
Signature of company official authorizing this bid:	<input style="width: 95%; height: 15px;" type="text"/>
Company Official (Print name):	<input style="width: 95%; height: 15px;" type="text"/>
Position with company:	<input style="width: 95%; height: 15px;" type="text"/>

**CITY OF LEWISVILLE
DISCLOSURE OF INTEREST**

Pursuant to Chapter 176 of the Texas Local Government Code, a person or agent of a person who contracts or seeks to contract with the City of Lewisville must complete a conflict of interest questionnaire if the person or agent has an affiliation or business relationship that might cause a conflict of interest with the City. The conflict of interest questionnaire, which is available online at ethics.state.tx.us, must be filed with the City Secretary of the City of Lewisville no later than the seventh (7th) business day after the person or agent begins contract discussions or negotiations with the City of Lewisville or submits to the City of Lewisville an application, response to a request for proposal or bid, correspondence, or another writing related to a potential agreement with the City of Lewisville. An updated Conflict of Interest Questionnaire must be filed in accordance with Chapter 176 of the Local Government Code.

Seller should consult with legal counsel if they have questions regarding its compliance with the requirements of Chapter 176. It is the responsibility of each person or agent who is contracting or seeking to contract with the City of Lewisville to comply with the filing requirements of Chapter 176.



LEWISVILLE
Deep Roots. Broad Wings. Bright Future.

Lewisville 2025 - Sustainability

Lewisville City Council unanimously adopted the Lewisville 2025 plan on July 14, 2014. The plan was developed after more than a year of public input and discussion that garnered hundreds of ideas and suggestions. That input was studied extensively by the Lewisville 2025 Steering Committee, City staff and professional consultants and formulated into the Lewisville 2025 plan. The plan provides a clear shared vision for the kind of community Lewisville wants to be when it turns 100 years old in 2025: a place that people choose to live, work and visit.

Lewisville 2025 identifies nine “Big Moves” to guide the community’s efforts toward being a thriving, desirable community. One of these Big Moves is sustainability. Lewisville defines sustainability in this way:

Limited resources, such as land, water, energy, clean air, natural assets, and public funds are used efficiently to provide a desirable quality of life and business climate today without reducing Lewisville’s ability to provide the desired quality of life and business climate for success of future generations.

The Purchasing Division’s goal is to support and encourage sustainable management practices through the purchase and use of materials, products and services that demonstrate environmental stewardship as well as fiscal and social responsibility. To that end, Lewisville will consider environmental factors such as but not limited to, recycled content, product life cycle, waste reduction, energy efficiency, toxicity, water consumption, and human health impacts when making purchasing recommendations. To assist City staff with evaluating these factors, prospective vendors may be required to provide specific information about their products and services that addresses environmental impacts.

Does Product or Service?	Yes	No	Details
Reduce energy consumption			
Reduce toxicity, including emissions			
Reduce waste			
Contain recyclable materials			
Reduce water consumption			
List other environmental impacts			

Attach supporting documentation if needed

**PURCHASE ORDER
TERMS & CONDITIONS**

Seller and Buyer agree to comply with the following terms and conditions. These Terms and Conditions along with the purchase order shall constitute a contract between the Seller and Buyer upon the Seller issuing an invoice and/or providing any of the goods and services described in the purchase order. In the event of a conflict between these Terms and Conditions and a separate written agreement between the Seller and Buyer, the terms of the separate written agreement shall prevail.

1. **SELLER TO PACKAGE GOODS:** Seller will package goods in accordance with good commercial practice. Each shipping container shall be clearly and permanently packed as follows: (a) Seller's name and address; (b) Consignee's name, address and purchase order or purchase order release number and the supply agreement number if applicable; (c) Container number and total number of containers, e.g. box 1 of 4 boxes; and (d) the number of the container bearing the packing slip. Seller shall bear cost of packaging unless otherwise provided. Goods shall be suitably packed to secure lowest transportation costs and to conform with requirements of common carriers and any applicable specifications. Buyer's count or weight shall be final and conclusive on shipments not accompanied by packing lists.
2. **SHIPMENT UNDER RESERVATION PROHIBITED:** Seller is not authorized to ship the goods under reservation and no tender of a bill of lading will operate as a tender of goods.
3. **TITLE AND RISK OF LOSS:** The title and risk of loss of the goods shall not pass to Buyer until Buyer actually receives and takes possession of the goods at the point or points of delivery.
4. **DELIVERY TERMS AND TRANSPORTATION CHARGES:** F.O.B. Inside Delivery, Municipal Facility, Lewisville, Texas, and shall include all delivery and packaging costs. The Buyer assumes no liability for goods delivered in damaged or unacceptable condition. The Seller shall handle all claims with carriers, and in case of damaged goods, shall ship replacement goods immediately upon notification by Seller of damage.
5. **NO REPLACEMENT OF DEFECTIVE TENDER:** Every tender or delivery of goods must fully comply with all provisions of this contract as to time of delivery, quality and the like. If a tender is made which does not fully conform, this shall constitute a breach and Seller shall not have the right to substitute a conforming tender provided, where the time for performance has not yet expired, the Seller may notify Buyer of his intention to cure and may then make a conforming tender within the contract time but not afterward.
6. **PLACE OF DELIVERY:** The place of delivery shall be that set forth on the purchase order. Any change thereto shall be effected by modification as provided for in Clause 20, "Modifications", hereof. The terms of this contract are "no arrival, no sale".
7. **INVOICES AND PAYMENTS:** (a) Seller shall submit separate invoices on each purchase order after each delivery. Invoices shall indicate the purchase order number, shall be itemized and transportation charges, if any, shall be listed separately. A copy of the bill of lading, and the freight weigh bill when applicable, should be attached to the invoice. Mail to: City of Lewisville Accounts Payable, PO Box 299002 Lewisville, Texas 75029-9002. Payments shall be made thirty days after the goods are delivered to the Buyer, or a correct invoice is received, whichever is later. Suppliers should keep the Accounts Payable Office advised of any changes in remittance addresses. (b) Buyer's obligation is payable only and solely from funds available for the purpose of the purchase. Lack of funds shall render this contract null and void to the extent funds are not available and any delivered but unpaid for goods will be returned to Seller by Buyer. (c) Do not include Federal Excise, State or City Sales Tax. Buyer shall furnish tax exemption certificate, if required.
8. **GRATUITIES:** The Buyer may, by written notice to the Seller, cancel this contract without liability to Seller if it is determined by Buyer that gratuities, in the form of entertainment, gifts, or otherwise, were offered or given by the Seller, or any agent, or representative of the Seller, to any officer or employee of the City of Lewisville with a view toward securing a contract or securing favorable treatment with respect to the awarding or amending or the making or any determinations with respect to the performing of such a contract. In the event this contract is cancelled by Buyer pursuant to this provision, Buyer shall be entitled, in addition to any other rights and remedies, to recover or withhold the amount of the cost incurred by Seller in providing such gratuities.
9. **SPECIAL TOOLS AND TEST EQUIPMENT:** If the price stated on the face hereof includes the cost of any special tooling or special test equipment fabricated or required by Seller for the purpose of filling this order, such special tooling equipment and any process sheets related thereto shall become the property of the Buyer and to the extent feasible shall be identified by the Seller as such.
10. **WARRANTY PRICE:** (a) The price to be paid by the Buyer shall be that contained in Seller's bid which Seller warrants to be no higher than Seller's current prices on orders by others for products of the kind and specification covered by this contract for similar quantities under similar or like conditions and methods of purchase. In the event Seller breaches this warranty, the prices of the items shall be reduced to the Seller's current prices on orders by others, or in the alternative, Buyer may cancel this contract without liability to Seller for breach or Seller's actual expense. (b) The Seller warrants that no person or selling agency has been employed or retained to solicit or secure this contract upon an agreement or understanding for commission, percentage, brokerage, or contingent fee excepting bona fide employees of bona fide established commercial or selling agencies maintained by the Seller for the purpose of securing business. For breach of violation of this warranty, the Buyer shall have the right in addition to any other right or rights to cancel this contract without liability and to deduct from the contract price, or otherwise recover the full amount of such commission, percentage, brokerage or contingent fee.
11. **WARRANTY PRODUCTS:** Seller shall not limit or exclude any implied warranties and any attempt to do so shall render this contract voidable at the option of the Buyer. Seller warrants that the goods furnished will conform to the specifications, drawings and descriptions listed in the bid invitation and to the sample(s) furnished by Seller, if any. In the event of a conflict between the specifications, drawings and descriptions, the specifications shall govern.
12. **SAFETY WARRANTY:** Seller warrants that the product sold to Buyer shall conform to the standards promulgated by the U. S. Department of Labor under the Occupational Safety and Health Act of 1970. In the event the product does not conform to OSHA standards, Buyer may return the product for correction or replacement at the Seller's expense. In the event Seller fails to make the appropriate correction within a reasonable time, correction made by Buyer will be at Seller's expense.
13. **NO WARRANTY BY BUYER AGAINST INFRINGEMENTS:** As part of this contract for sale Seller agrees to ascertain whether goods manufactured in accordance with the specifications attached to this contract will give rise to the rightful claim of any third person by way of infringement or the like. Buyer makes no warranty that the production of goods according to the specification will not give rise to such a claim, and in no event shall Buyer be liable to Seller for indemnification in the event that Seller is sued on the grounds of infringement or the like. If seller is of the opinion that an infringement or the like will result, he will notify Buyer to this effect in writing within two weeks after the signing of this contract. If Buyer does not receive notice and is subsequently held liable for the infringement of the like, Seller will save Buyer harmless. If Seller in good faith ascertains that production of the goods in accordance with the specifications will result in infringement or the like, this contract shall be null and void except that Buyer will pay Seller the reasonable cost of his search as to infringements.
14. **RIGHT OF INSPECTION:** Buyer shall have the right to inspect the goods at delivery before accepting them.
15. **CANCELLATION:** Buyer shall have the right to cancel for default all or any part of the undelivered portion of this order if Seller breaches any of the terms hereof including warranties of Seller or if the Seller becomes insolvent or commits acts of bankruptcy. Such right of cancellation is in addition to and not in lieu of any other remedies which Buyer may have in law or equity.
16. **TERMINATION:** The performance of work under this order may be terminated in whole or in part by the Buyer in accordance with this provision. Termination of work hereunder shall be effected by the delivery to the Seller of a "Notice of Termination" specifying the extent to which performance of work under the order is terminated and the date upon which such termination becomes effective. Such right of termination is in addition to and not in lieu of rights of Buyer set forth in Clause 15, herein.
17. **FORCE MAJEURE:** If by reason of Force Majeure, either party hereto shall be rendered unable wholly or in part to carry out its obligations under this contract then such party shall give notice and full particulars of Force Majeure in writing to the other party within a reasonable time after occurrence of the event or cause relied upon, and the obligation of the party giving such notice, so far as it is affected by such Force Majeure, shall be suspended during the continuance of the inability then claimed, except as hereinafter provided, but for no longer period, and such party shall endeavor to remove or overcome such inability with all reasonable dispatch. The term Force Majeure as employed herein, shall mean acts of God, strikes, lockouts, or other industrial disturbances, act of public enemy, orders of any kind of government of the United States or the State of Texas or any civil military authority, insurrections, riots, epidemics, landslides, lightning, earthquakes, fires, hurricanes, storms, floods, washouts, droughts, arrests, restraint of government and people, civil disturbances, explosions, breakage or accidents to machinery, pipelines or canals, or other causes not reasonably within the control of the party claiming such inability.

18. **ASSIGNMENT DELEGATION:** No right or interest in this contract shall be assigned or delegation of any obligation made by Seller without the written permission of the Buyer. Any attempted assignment or delegation by Seller shall be wholly void and totally ineffective for all purposes unless made in conformity with this paragraph.

19. **WAIVER:** No claim or right arising out of a breach of this contract can be discharged in whole or in part by a waiver or renunciation of the claim or right unless the waiver or renunciation is supported by consideration and is in writing signed by the aggrieved.

20. **MODIFICATIONS:** This contract may be modified or rescinded only by a writing signed by both of the parties or their duly authorized agents. This shall include any change orders.

21. **INTERPRETATION PAROLE EVIDENCE:** This writing is intended by the parties as a final expression of their agreement and is intended also as a complete and exclusive statement of the terms of their agreement. No course of prior dealings between the parties and no usage of the trade shall be relevant to supplement or explain any term used in this contract. Acceptance or acquiescence in a course of performance rendered under this contract shall not be relevant to determine the meaning of this contract even though the accepting or acquiescing party has knowledge of the performance and opportunity for objection. Whenever a term defined by the Uniform Commercial Code is used in this contract, the definition contained in the Code is to control.

22. **APPLICABLE LAW:** This contract shall be governed by the Uniform Commercial Code. Wherever the term "Uniform Commercial Code" is used, it shall be construed as meaning the Uniform Commercial Code as adopted in the State of Texas as effective and in force on the date of this contract.

23. **ADVERTISING:** Seller shall not advertise or publish, without Buyer's prior consent, the fact that Buyer has entered into this contract, except to the extent necessary to comply with proper requests for information from an authorized representative of the federal, state or local government.

24. **RIGHT TO ASSURANCE:** Whenever one party to this contract in good faith has reason to question the other party's intent to perform he may demand that the other party give written assurance of his intent to perform. In the event that a demand is made and no assurance is given within five (5) days, the demanding party may treat this failure as an anticipatory repudiation of the contract.

25. **VENUE:** Both parties agree that venue for any litigation arising from this contract shall lie in Denton County, Texas.

26. **DISCLOSURE:** Pursuant to Chapter 176 of the Texas Local Government Code, a person or agent of a person who contracts or seeks to contract with the City of Lewisville must complete a conflict of interest questionnaire if the person or agent has an affiliation or business relationship that might cause a conflict of interest with the City. The conflict of interest questionnaire, which is available online at ethics.state.tx.us, must be filed with the City Secretary of the City of Lewisville no later than the seventh business day after the person or agent begins contract discussions or negotiations with the City of Lewisville or submits to the City of Lewisville an application, response to a request for proposal or bid, correspondence, or another writing related to a potential agreement with the City of Lewisville. An updated conflict of interest questionnaire must be filed in accordance with Chapter 176 of the Local Government Code

Seller should consult with legal counsel if you have questions regarding its compliance with the requirements of Chapter 176. It is the responsibility of each person or agent who is contracting or seeking to contract with the City of Lewisville to comply with the filing requirements of Chapter 176.

27. **INDEPENDENT CONTRACTOR:** Seller shall be considered an independent contractor and not an agent, servant, employee, or representative of Buyer in the performance of the work. No term or provision herein or act of the Seller shall be construed as changing that status.

28. **TERMINATION FOR DEFAULT:** Buyer reserves the right to enforce the performance of any Purchase Order in any manner prescribed by law or deemed to be in the best interest of Buyer in the event of breach or default. The Buyer reserves the right to terminate any purchase order and/or agreement with the Seller in the event the Seller fails to: (a) meet delivery schedules, or (b) otherwise perform in accordance with these terms and conditions.

29. **PROTESTS:** All protests regarding the solicitation process must be submitted in written form to the Purchasing Manager within five (5) working days following the opening of bids/proposals. This includes all protests relating to legal advertisements, deadlines, bid/proposal openings, and all other related procedures under the Local Government Code

Post-award protests must be submitted in written form to the City Manager within five (5) working days after award. The protest must include, at a minimum, the name of protester, bid/proposal number or description of goods or services, and a statement of grounds for protest.

30. INDEMNIFICATION: SELLER AGREES TO DEFEND, INDEMNIFY AND HOLD BUYER, ITS OFFICERS, AGENTS AND EMPLOYEES, HARMLESS AGAINST ANY AND ALL CLAIMS, LAWSUITS, JUDGMENTS, COSTS AND EXPENSES FOR PERSONAL INJURY (INCLUDING DEATH), PROPERTY DAMAGE OR OTHER HARM FOR WHICH RECOVERY OF DAMAGES IS SOUGHT, SUFFERED BY ANY PERSON OR PERSONS, THAT MAY ARISE OUT OF OR BE OCCASIONED BY SELLER'S BREACH OF ANY OF THESE TERMS AND CONDITIONS OR BY ANY NEGLIGENT OR STRICTLY LIABLE ACT OR OMISSION, INTENTIONAL TORT, INTELLECTUAL PROPERTY INFRINGEMENT, OR FAILURE TO PAY A SUBCONTRACTOR OR SUPPLIER COMMITTED BY SELLER, ITS OFFICERS, AGENTS, EMPLOYEES OR SUBCONTRACTORS, IN THE PERFORMANCE OF THIS CONTRACT; EXCEPT THAT THE INDEMNITY PROVIDED FOR IN THIS PARAGRAPH SHALL NOT APPLY TO ANY LIABILITY RESULTING FROM THE SOLE NEGLIGENCE OR FAULT OF BUYER, ITS OFFICERS, AGENTS, EMPLOYEES OR SEPARATE CONTRACTORS, AND IN THE EVENT OF JOINT AND CONCURRING NEGLIGENCE OR FAULT OF THE SELLER AND BUYER, RESPONSIBILITY AND INDEMNITY, IF ANY, SHALL BE APPORTIONED IN ACCORDANCE WITH THE LAW OF THE STATE OF TEXAS, WITHOUT WAIVING ANY GOVERNMENTAL IMMUNITY AVAILABLE TO BUYER UNDER TEXAS LAW AND WITHOUT WAIVING ANY DEFENSES OF THE PARTIES UNDER TEXAS LAW. THE PROVISIONS OF THIS PARAGRAPH ARE SOLELY FOR THE BENEFIT OF THE PARTIES HERETO AND NOT INTENDED TO CREATE OR GRANT ANY RIGHTS, CONTRACTUAL OR OTHERWISE, TO ANY OTHER PERSON OR ENTITY.

31. **SEVERABILITY:** In case any one or more of the provisions contained in these Terms and Conditions shall for any reason be held to be invalid, illegal, or unenforceable in any respect, such invalidity, illegality, or unenforceability shall not affect any other provision thereof, and these Terms and Conditions shall be construed as if such invalid, illegal, or unenforceable provision had never been contained herein.

32. **IMMIGRATION REFORM AND CONTROL ACT (8 U.S.C 1324a):** The Buyer supports the Immigration Reform and Control Act (IRCA), which is a comprehensive scheme prohibiting the employment of unauthorized aliens in the United States. The Seller and its subcontractors shall at all times during the term of the contract with the Buyer comply with the requirements of IRCA and shall notify the Buyer within fifteen (15) working days of receiving notice of a violation of IRCA. The Seller also warrants that it has not had an IRCA violation within the last five (5) years. The Buyer may terminate a contract with the Seller if the Buyer determines that (a) the Seller or its subcontractors have been untruthful regarding IRCA violations in the preceding five (5) years or (b) the Seller or its subcontractors fail to timely notify the Buyer of an IRCA violation.

33. **ADA COMPLIANCE:** All goods and services provided to the Buyer must be compliant with the Americans with Disabilities Act and any amendments thereto (the "ADA") and all regulations promulgated pursuant to the ADA. Seller will be required to certify compliance, if required under the law or otherwise required by the Buyer.

34. **PROTECTION OF RESIDENT WORKERS:** The Buyer actively supports the Immigration and Nationality Act (INA), which includes provisions addressing employment eligibility, employment verification, and nondiscrimination. Under the INA, employers may hire only persons who may legally work in the United States (i.e., citizens and nationals of the U.S.) and aliens authorized to work in the U.S. The employer must verify the identity and employment eligibility of anyone to be hired, which includes completing the Employment Eligibility Verification Form (I-9). The Seller shall establish appropriate procedures and controls so no services under the contract will be performed by any worker who is not legally eligible to perform such services or employment. The Buyer reserves the right to audit Seller's employment records to verify the existence of a completed Employment Eligibility Verification Form (I-9) for every worker performing services under the contract. The audit will be at the Buyer's expense.

35. **NO BOYCOTT OF ISRAEL.** Pursuant to Texas Government Code Chapter 2270, the Seller agrees that acceptance of these Terms & Conditions serves as written verification that Contractor: (1) does not boycott Israel, as defined by Texas Government Code Section 808.001; and (2) will not boycott Israel during the term of the contract.

36. **COMPANIES ENGAGED IN BUSINESS WITH IRAN, SUDAN, OR FOREIGN TERRORIST ORGANIZATION.** Pursuant to Texas Government Code Chapter 2252, Subchapter F, Seller affirms that it is not identified on a list created by the Texas Comptroller of Public Accounts as a company known to have contracts with or provide supplies or services to a foreign terrorist organization.

Question and Answers for Bid #18-65-I - Main, Mill & Charles Street Paving, Drainage, Landscape and Signalization

Overall Bid Questions

There are no questions associated with this bid.