



SPECIFICATIONS AND CONTRACT DOCUMENTS

FOR THE CONSTRUCTION OF

**VITRUVIAN PARK
PUBLIC INFRASTRUCTURE – BLOCK 200
TOWN OF ADDISON, TEXAS**

**Infrastructure & Development Services # 2016-09
Bid Number 16-184**

August, 2016

PREPARED BY:

icon Consulting Engineers, Inc.
Civil Engineers - Designers - Planners
Engineering Firm Registration Number F-9007

**2840 W. Southlake Blvd., Suite 110
Southlake, Texas 76092
(817) 552-6210**



TOWN OF ADDISON, TEXAS

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CITY SECRETARY

Laura Bell

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SECTION AB

ADVERTISEMENT FOR BIDS

ADVERTISEMENT FOR BIDS

1. Sealed bids addressed to the Town of Addison, Texas, for **Paving, Drainage and Utility Improvements for Vitruvian Park Public Infrastructure – Block 200** in the Town of Addison, Texas, hereinafter called “City” or “Owner” in accordance with specifications and contract documents prepared by **Icon Consulting Engineers, Inc.** will be received at the office of the Purchasing Department, 5350 Belt Line Road, Addison, Texas until **2:00 p.m. on Thursday, October 20, 2016**. Bids received by the appointed time will be opened and read aloud. Any bids received after closing time will be returned unopened.
2. The Contractor shall identify his bid on the outside of the envelope by writing the words **INFRASTRUCTURE & DEVELOPMENT SERVICES #2016-09, VITRUVIAN PARK PUBLIC INFRASTRUCTURE – BLOCK 200**.
3. Paper bids shall be required and accompanied by a cashier’s check or certified check upon a national or state bank in an amount not less than five percent (5%) of the total maximum bid price payable without recourse to the Town of Addison, or a bid bond in the same amount from a reliable surety company licensed by the State of Texas to act as a Surety and be listed on the current U.S. Treasury Listing of Approved Sureties, or a Binder of Insurance executed by a surety company licensed by the State of Texas to act as a surety or its authorized agent as a guarantee that the bidder will enter into a contract and execute a Performance Bond within ten (10) days after notice of award of contract to him.
4. Plans, specifications and bidding documents may be downloaded from www.bidsync.com. The Town of Addison is a “free buyer”, meaning that prospective bidders need only a free registration to sign up for plan updates. Bidders assume all risk for acquiring plans and/or specs from third party sites and plan rooms, as only Bidsync.com will be directly updated by Addison.
5. The right is reserved by the Mayor and the City Council as the interests of the City may require to reject any or all bids and to waive any informality in bids received and to select the proposal deemed most advantageous to the Town.
6. The Bidder (Proposer) must supply all the information required by the Proposal Form.
7. A Performance Bond, Labor and Material Payment Bond, and Maintenance Bond will be required by the Owner; each Bond shall be in the amount of 100% of the total contract amount. Bonds shall be issued by a surety company licensed by the State of Texas to act as a Surety and be listed on the current U.S. Treasury Listing of Approved Sureties.
8. For information, call Will Newcomer, Purchasing Manager, Town of Addison (972) 450-7091. For information on the work to be performed, call Jason Shroyer, P.E., Town of Addison, (972) 450-2849 or Bruce F. Dunne, P.E., Icon Consulting Engineers, Inc., (817) 552-6210.
9. The project consists of installing proposed public water, wastewater, storm drain, electrical, telecommunications and other related improvements in accordance with the plans and specifications.
11. Pre-Bid Conference will be held at 2:30 p.m., on Wednesday, October 12, 2016 in the Conference Room of the Town of Addison’s Service Center, 16801 Westgrove Dr., Addison, Texas 75001.

TOWN OF ADDISON, TEXAS

SECTION IB

INSTRUCTIONS TO BIDDERS

INSTRUCTIONS TO BIDDERS

- A. PROJECT: VITRUVIAN PARK PUBLIC INFRASTRUCTURE – PHASE V**, in the Town of Addison.

The bids will be evaluated as stated in Section "P" of the instructions to Bidders.

- B. PROJECT DESCRIPTION:** This project consists of furnishing and installing paving, drainage and utility improvements in accordance with the plans and specifications.

- C. PROPOSALS:** Proposals must be in accordance with these instructions in order to receive consideration.

- D. DOCUMENTS:** Documents include the Bidding Requirements, including the Advertisement for Bids, these Instructions to Bidders, Proposal Forms, Contract Agreement, Bid Bond, Performance Bond, Payment Bond, Maintenance Bond, Contractor's Affidavit of Bills Paid, General Provisions, Special Provisions, Technical Specifications, Waiver of Lien, Drawings, and Addenda which may be issued by the Town of Addison during the bidding period. Bidding Documents may be viewed and/or obtained under the terms and conditions set forth in the Advertisement for Bids, Section AB of this Project Manual.

- E. EXAMINATION OF DOCUMENTS AND SITE:** Bidders shall carefully examine the Bidding Documents and the construction site to obtain first-hand knowledge of the scope and the conditions of the Work. Each Contractor, Subcontractor and Sub-subcontractor, by submitting a proposal to perform any portion of the Work, represents and warrants that he has examined the Drawings, Specifications (Project Manual) and the site of the Work, and from his own investigation has satisfied himself as to the scope, accessibility, nature and location of the Work; the character of the equipment and other facilities needed for the performance of the Work; the character and extent of other work to be performed; the local conditions; labor availability, practices and jurisdictions and other circumstances that may affect the performance of the Work. No additional compensation will be allowed by the Owner for the failure of such Contractor, Subcontractor or Sub-subcontractor to inform himself as to conditions affecting the Work. **A Pre-Bid Meeting will be held at 2:30 P.M. on Wednesday, the 12th day of October, 2016** at the Addison Service Center, 16801 Westgrove Drive, Addison, Texas 75001.

- F. INTERPRETATION OF DOCUMENTS:** If any person contemplating submitting a bid for the proposed Contract is in doubt as to the meaning of any part of the Drawings, Specifications (Project Manual) or other proposed Contract Documents, he may submit to the Town of Addison, not later than seven (7) calendar days prior to the date set for opening bids, a written request for an interpretation or clarification. Bidders should act promptly and allow sufficient time for a reply to reach them before preparing their bids. Any interpretation or clarification will be in the form of an Addendum duly issued. No alleged verbal interpretation or ruling will be held binding upon the Owner.

- G. SUBSTITUTIONS:** Conditions governing the submission of substitutions for specific materials, products, equipment and processes are in the Special Provisions. Requests for substitutions must be received by the Town of Addison seven (7) calendar days prior to the established bid date.

- H. ADDENDA:** Interpretations, clarifications, additions, deletions and modifications to the Documents during the bidding period will be issued in the form of Addenda and a copy of such Addenda will be released through www.bidsync.com. It is the responsibility of each person who has been issued a set of bid documents to obtain addenda through www.bidsync.com. Addenda will be a part of the Bidding Documents and the Contract Documents, and receipt of them shall be acknowledged in the Bid Form. All such interpretations and supplemental instructions will be in the form of written addenda to the contract documents which, if issued, will be sent by telegram, certified or registered mail, facsimile, email or hand delivered to all prospective bidders (at the respective addresses furnished for such purposes) not later than three (3) calendar days prior to the date fixed for the opening of bids. If any bidder fails to acknowledge the receipt of such addenda in the space provided in the bid form, his bid will nevertheless be construed as though the receipt of such addenda had been acknowledged.
- I. COMPLETION TIME:** It is understood and agreed to between the Town of Addison and the Contractor that time is of the essence of this contract and that the time allocated for completion of this project will be **180 calendar days**. The time period shall commence ten (10) calendar days following written notification from the Town of Addison that the Contractor may begin work. Reference Special Provision 22 for Explanation of Contract Time. The completion date of the contract will be same date of the Town's final acceptance of the improvements.
- J. FAILURE TO COMPLETE ON TIME:** The time of completion is an essential element of this contract. For each day that any work shall remain uncompleted after the time specified in the proposal and the Contract, or the increased time granted by the Town of Addison, or as equitably increased by additional work or materials ordered after the Contract is signed, the sum of **\$500 per day** shall be deducted from the monies due the Contractor. The sum of money thus deducted for such delay, failure or noncompletion is not to be considered as a penalty, but shall be deemed, taken and treated as reasonable liquidated damages, per day that the Contractor shall be in default after the time stipulated in the Contract for completing the work. The said amounts are fixed and agreed upon by and between the Town of Addison and Contractor because of the impracticability and extreme difficulty of fixing and ascertaining the actual damages the Town of Addison would sustain and which shall be retained from the monies due, or that may become due, the Contractor under this Contract: and if said monies be insufficient to cover the amount owing, then the Contractor or its surety shall pay any additional amounts due. In the event that the actual damages incurred by the Town of Addison exceed the amount of liquidated damages, the Town of Addison shall be entitled to recover its actual damages.
- K. PREPARATION OF BIDS:** Prices quoted shall include all items of cost, expense, taxes, fees and charges incurred by, or arising out of, the performance of the work to be performed under the Contract. Bids shall be submitted in duplicate and shall be signed in ink. Any bid on other than the required form will be considered informal and may be rejected. Erasures or other changes in a bid must be explained or noted over the initials of the bidder. Bids containing any conditions, omissions, unexplained erasures and alterations, or irregularities of any kind may be rejected as informal. The prices should be expressed in words and figures or they may be deemed informal and may be rejected. In case of discrepancy between the prices written in the bid and those given in the figures, the price in writing will be considered as the bid. In the case of a discrepancy between a unit price and its extension, the unit price will govern. Failure to submit all requested information will make a bid irregular and subject to rejection. Bids shall be signed with name typed or printed below signature, and, if a partnership, give full name of all partners. Where bidder is a corporation, bids must be signed with the legal name of the corporation followed by the name of the state

of incorporation and the legal signature of an officer authorized to bind the corporation to a contract.

NOTE: AN ELECTRONIC SPREADSHEET IS POSTED ON BIDSYNC FOR THE CONTRACTORS CONVENIENCE. THIS SPREADSHEET MAY BE USED IN LIEU OF THE MANUAL HANDWRITTEN PROPOSAL FORM IN THE SPECIFICATIONS AND SHALL BE ATTACHED TO THE PROPOSAL AND MADE PART OF THE CONTRACT DOCUMENTS. USING THE SPREADSHEET OPTION SHALL NOT AMEND NOR MODIFY ANY WORDING IN THE PROPOSAL FORM OR THE PLANS AND THE CONTRACTOR SHALL BE RESPONSIBLE FOR CONFIRMING THAT THE SPREADSHEET ADEQUATELY CONVEYS THEIR BID.

- L. SUBMITTAL OF BIDS:** Sealed proposals will be received at the time, date and place stated in the Advertisement for Bids. Proposals shall be made on unaltered Proposal Forms furnished by the Town of Addison. Submit proposal in an opaque, sealed envelope addressed to the Owner and plainly mark on the outside of the envelope the project name, and the name and address of the bidder. The envelopes shall be marked with the following project names:

INFRASTRUCTURE & DEVELOPMENT SERVICES # 2016-09
VITRUVIAN PARK PUBLIC INFRASTRUCTURE – BLOCK 200

The Bid Bond must be completed and signed by each bidder and submitted with the bid. Submit Bids by mail or in person prior to the time for receiving bids set forth in the Advertisement for Bids issued by the Town.

Electronic bidding on bidsync.com will not be considered for this project. The Town of Addison uses bidsync to distribute bids and proposals. There will be NO COST to the contractor for standard bids or proposals. The project is considered a standard bid. For cooperative Bids and Reverse Auctions ONLY, the successful contractor/supplier agrees to pay bidsync a transaction fee of one percent (1%) of the total amount of all contracts for goods and/or services. Cooperative Bids and Reverse Auctions will be clearly marked on the bid documents. To assure that all contractors/suppliers are treated fairly, the fee will be payable whether the bid/proposal is submitted electronically, or by paper means. Refer to www.bidsync.com for further information.

- M. MODIFICATION AND WITHDRAWAL OF BIDS:** Prior to the time set for bid opening, bids may be withdrawn or modified. Bids may be modified only on the official bid form and must be signed by a person legally empowered to bind the bidder. No bidder shall modify, withdraw or cancel his bid or any part thereof for sixty (60) calendar days after the time agreed upon for the receipt of bids.
- N. DISQUALIFICATION:** The Owner reserves the right to disqualify proposals, before or after the opening, upon evidence of collusion with intent to defraud or other illegal practices relating to this proposal upon the part of the bidder.
- O. SUBMISSION OF POST-BID INFORMATION:** Upon notification of acceptance, the selected bidder shall, within five (5) calendar days, submit the following:
1. A designation of the portions of the Work proposed to be performed by the bidder with his own force.

2. A list of names of the subcontractors or other persons or organizations, including those who are to furnish materials and equipment fabricated to a special design proposed for such portions of the Work as may be designated in the Bidding Documents or as may be requested by the Town of Addison. The bidder will be required to establish to the satisfaction of the Owner the reliability and responsibility of the proposed Subcontractors and suppliers to furnish and perform the Work.
3. Other information as required.

P. AWARD: The Owner reserves the right to accept any or to reject any bids without compensation to bidders and to waive irregularities and informalities. The Town of Addison Infrastructure & Development Services Department, in making its recommendation, will consider the following elements:

1. Whether the bidder is a contractor with experience in the type of work involved.
2. Whether the bidder has adequate plant, equipment and personnel to perform the work properly and expeditiously.
3. Whether the bidder has a suitable financial status and reputation for meeting obligations incident to work of the kind specified.
4. Whether the bidder has complied with the terms and conditions of the A+B bidding.

Alternate items may or may not be awarded. Addition or deletion of other items or schedules will be governed by the *Standard Specifications for Public Works Construction – North Central Texas, 4th Edition*, (hereinafter called SSPWC) Item 104.2 "Change or Modification of Contract".

Q. EXECUTION OF THE CONTRACT: The successful bidder will be required to enter into a contract with the Owner within ten (10) days of notice by the Owner that his bid has been accepted. Failure to enter into a contract within the established time limit shall be considered grounds for forfeiture of the bid bond.

R. CONSTRUCTION SCHEDULE: It is the Owner's desire to have the project completed and operational in as short a time as possible. The number of calendar days for completion of the project will begin with the date specified in the Notice to Proceed. The Notice to Proceed will be issued in a manner to facilitate a smooth construction of the project. The Contractor shall begin construction within ten (10) calendar days of the issuance of the Notice to Proceed.

S. FORM OF CONTRACT: The contract for the construction of the project will be drawn up by the Owner. A sample form of agreement is included in the Contract Agreement Section.

T. BONDS: A Performance Bond, a Labor and Material Payment Bond and a Maintenance Bond will be required by the Owner. The performance and payment bonds shall name the Town of Addison, and others as directed by the Town, as joint obligees. Sample forms have been included in the Performance Bond, Payment Bond and Maintenance Bond sections.

U. BID SECURITY: Bids shall be accompanied by a cashier's check or certified check upon a national or state bank in an amount not less than five percent (5%) of the total maximum bid price payable without recourse to the Town of Addison, or a bid bond in the same amount from a surety company licensed to do business in the State of Texas as a guarantee that the

bidder will enter into a contract and execute a Performance Bond and Payment Bond within ten (10) calendar days after notice of award of contract to him. Such checks or bid bonds will be returned to all except the three lowest bidders within three (3) days after the opening of bids, and the remaining checks or bid bonds will be returned promptly after the Owner has made an award of contract, or, if no award has been made within thirty (30) calendar days after the date of the opening of bids, upon demand of the bidder at any time thereafter, so long as he has not been notified of the acceptance of his bid.

V. RESOLUTIONS: If the bidder is a corporation, a copy of the resolution empowering the person submitting the bid to bind the bidder must be included with the bid.

W. CONSTRUCTION STAKING: Construction staking and re-staking will not be provided by the Owner. Benchmarks and Horizontal Control are shown on the plans. There is no separate bid item for staking, therefore, the contractor must include value for staking in the various bid items as subsidiary to the contract. Any staking or re-staking that is required shall be the responsibility of the Contractor and shall be at no cost to the Owner.

X. FINAL PAYMENT: The general provisions for Final Payment shall be as stated in Item 1.09.5.4 of the North Central Texas Standard Specifications for Public Works Construction (4th Edition) including all Amendments and Additions. Prior to final payment the Contractor shall provide the Owner with the following items:

1. A Contractor's Affidavit of Bills Paid in accordance with Section BP.
2. A Consent of Surety Company to Final Payment.
3. A complete set of record plans which indicate all construction variations from the original construction documents in accordance with Item 5 of the Special Provisions.
4. A two (2) year Maintenance Bond in accordance with Section MB.
5. Acknowledgement that the project has been reviewed and accepted by TDLR.

Y. PREVAILING WAGE RATES: Wage rates paid on this project shall not be less than specified in the schedule of general prevailing rates of per diem wages as attached in the Special Provisions.

Z. PRIORITY OF CONTRACT DOCUMENTS: In case of conflict between contract documents, priority of interpretation shall be in the following order: signed agreement, performance and payment bonds, proposal, special provisions (or conditions), technical specifications, general provisions, advertisement for bids, project drawings, *Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges* adopted by the Texas Department of Transportation June 1, 2004; Standard Specifications for Public Works Construction – North Central Texas (NCTCOG, October 2004); Town of Addison Standard Drawings. This priority list shall take precedence over item 1.05.1 of the SSPWC.

SECTION PF

PROPOSAL FORM

PROPOSAL FORM

10/25/ , 2016

TO: The Honorable Mayor and Town Council
Town of Addison, Texas

Gentlemen:

The undersigned bidder, having examined the plans, specifications and contract documents, and the location of the proposed work, and being fully advised as to the extent and character of the work, proposes to furnish all equipment and to perform labor and work necessary for completion of the work described by and in accordance with the Plans, Specifications and Contract for the following prices, to wit:

Signed by:  _____

ACKNOWLEDGMENT OF ADDENDA:

The Bidder acknowledges receipt of the following addenda:

- Addendum No. 1 EAH
- Addendum No. 2 _____
- Addendum No. 3 _____

VITRUVIAN PARK PUBLIC INFRASTRUCTURE - BLOCK 200
PAVING, DRAINAGE AND UTILITY IMPROVEMENTS
TOWN OF ADDISON PROJECT #2016-09

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
1	1	L.S.	<p>For Mobilization (not to exceed 5% of total bid amount)</p> <p>complete in place, the sum of <u>one hundred fifty thousand</u></p> <p style="text-align: right;">Dollars</p> <p>and <u>zero</u></p> <p>Cents per Lump Sum</p>	150,000.00	150,000.00
2	1	L.S.	<p>For Installation and Maintenance of Barricades, Signage, Pav't Markings and Traffic Control Measures for Marsh Lane Water Improvements</p> <p>complete in place, the sum of <u>10</u></p> <p><u>Ten thousand</u></p> <p style="text-align: right;">Dollars</p> <p>and <u>zero</u></p> <p>Cents per Lump Sum</p>	10,000.00	10,000.00
3	1	L.S.	<p>For Installation and Maintenance of Barricades, Signage, Pav't Markings and Traffic Control Measures for Marsh Lane Sanitary Sewer Improvements</p> <p>complete in place, the sum of _____</p> <p><u>Nine thousand</u></p> <p style="text-align: right;">Dollars</p> <p>and <u>zero</u></p> <p>Cents per Lump Sum</p>	9,000.00	9,000.00
4	1	L.S.	<p>For Installation and Maintenance of Barricades, Signage, Pav't Markings and Traffic Control Measures for Marsh Lane and Vitruvian Way Paving Improvements</p> <p>complete in place, the sum of _____</p> <p><u>Fifteen thousand</u></p> <p style="text-align: right;">Dollars</p> <p>and <u>zero</u></p> <p>Cents per Lump Sum</p>	15,000.00	15,000.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
5	2	EA.	<p>For Furnishing and Installing Project Signs in Accordance with Sign Plan</p> <p>complete in place, the sum of _____</p> <p><u>One thousand</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	1,000.00	2,000.00
6	1	L.S.	<p>For Compliance with Storm Water Pollution Prevention Plan Including Maintenance of Erosion Control Devices</p> <p>complete in place, the sum of _____</p> <p><u>Four thousand</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Lump Sum</p>	4,000.00	4,000.00
7	3	EA.	<p>For Furnishing, Installation and Maintenance of Construction Entrance</p> <p>complete in place, the sum of _____</p> <p><u>Four thousand</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	4,000.00	12,000.00
8	1,335	L.F.	<p>For Furnishing, Installation and Maintenance of Silt Fence Sediment Barrier</p> <p>complete in place, the sum of _____</p> <p><u>Four</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	4.00	5,340.00
9	18	EA.	<p>For Furnishing, Installation and Maintenance of Inlet Protection Devices</p> <p>complete in place, the sum of _____</p> <p><u>Two Hundred</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	200.00	3,600.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
10	110	L.F.	<p>For Furnishing, Installation and Maintenance of Tree Protection Fencing</p> <p>complete in place, the sum of _____</p> <p><u>Two</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	2.00	220.00
11	2,715	S.Y.	<p>For Sawcutting, Removal & Recycling of Existing Asphalt Street Pavement (Reference Special Provision 85)</p> <p>complete in place, the sum of _____</p> <p><u>Ten</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Square Yard</p>	10.00	27,150.00
12	1,025	S.Y.	<p>For Sawcutting, Removal & Recycling of Existing Concrete Street Pavement (Reference Special Provision 85)</p> <p>complete in place, the sum of _____</p> <p><u>Fifteen</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Square Yard</p>	15.00	15,375.00
13	2,441	S.F.	<p>For Sawcutting, Removal & Recycling of Existing Concrete Sidewalk Pavement (Reference Special Provision 85)</p> <p>complete in place, the sum of _____</p> <p><u>Two</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Square Foot</p>	2.00	4,882.00
14	746	L.F.	<p>For Sawcutting, Removal and Recycling of Existing Concrete Curb and Gutter</p> <p>complete in place, the sum of _____</p> <p><u>Ten</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	10.00	7,460.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
15	1	EA.	<p>For Removal and Disposal of Existing Drop Inlet and Concrete Apron</p> <p>complete in place, the sum of _____</p> <p><u>Two thousand</u> Dollars</p> <p>and <u>zero</u></p> <p>Cents per Each</p>	2,000.00	2,000.00
16	1	EA.	<p>For Removal and Disposal of Existing 10' Curb Inlet</p> <p>complete in place, the sum of _____</p> <p><u>Two thousand</u> Dollars</p> <p>and <u>zero</u></p> <p>Cents per Each</p>	2,000.00	2,000.00
17	45	EA.	<p>For Removal and Disposal of Existing Trees</p> <p>complete in place, the sum of _____</p> <p><u>Three Hundred</u> Dollars</p> <p>and <u>zero</u></p> <p>Cents per Each</p>	300.00	13,500.00
18	850	L.F.	<p>For Removal and Disposal of Existing Cable Barrier Fence</p> <p>complete in place, the sum of _____</p> <p><u>Four</u> Dollars</p> <p>and <u>zero</u></p> <p>Cents per Linear Foot</p>	4.00	3,400.00
19	1	L.S.	<p>For Removal and Disposal of Existing Overhead Secondary (450 LF) and 3 Poles with Lights</p> <p>complete in place, the sum of _____</p> <p><u>Five thousand</u> Dollars</p> <p>and <u>zero</u></p> <p>Cents per Lump Sum</p>	5,000.00	5,000.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
20	420	L.F.	<p>For Removal and Disposal of Existing Concrete Block Wall and Footing</p> <p>complete in place, the sum of _____</p> <p><u>Forty</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	40.00	16,800.00
21	32	L.F.	<p>For Removal and Disposal of Existing 6' High Chain Link Fencing</p> <p>complete in place, the sum of _____</p> <p><u>Fourteen</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	14.00	448.00
22	3	E.A.	<p>For Removal, Storage and Re-installation of Existing Street Signage</p> <p>complete in place, the sum of _____</p> <p><u>One Hundred Twenty</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	120.00	360.00
23	1	L.S.	<p>For Removal and Disposal of Existing Tree Planters and Bollards along Marsh Lane</p> <p>complete in place, the sum of _____</p> <p><u>Four thousand</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Lump Sum</p>	4,000.00	4,000.00
24	2,465	C.Y.	<p>For Unclassified Street Excavation and Controlled Density Placement of Embankment Materials for Westgate Lane, Drive Approach on Marsh Lane and Parallel Parking along Vitruvian Way</p> <p>complete in place, the sum of _____</p> <p><u>Twenty</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Cubic Yard</p>	20.00	49,300.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
25	4,595	S.Y.	For Fine Grading and Subgrade Preparation complete in place, the sum of _____ <u>Four</u> Dollars and <u>Zero</u> Cents per Square Yard	4.00	18,380.00
26	4,595	S.Y.	For 6" Lime Stabilized Subgrade complete in place, the sum of _____ <u>Seven</u> Dollars and <u>Zero</u> Cents per Square Yard	7.00	32,165.00
27	83	TONS	For Furnishing and Placing Hydrated Lime (8% by Weight) complete in place, the sum of _____ <u>Two Hundred Ten</u> Dollars and <u>Zero</u> Cents per Ton	210.00	17,430.00
28	3,861	S.Y.	For Furnishing and Placing 10" Reinforced Concrete Street Pavement (4200 PSI) complete in place, the sum of _____ <u>Niney Five</u> Dollars and <u>Zero</u> Cents per Square Yard	95.00	366,795.00
29	103	S.Y.	For Furnishing and Placing 8" Reinforced Concrete Street Pavement (4200 PSI) complete in place, the sum of _____ <u>One Hundred Fifteen</u> Dollars and <u>Zero</u> Cents per Square Yard	115.00	11,845.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
30	2,586	L.F.	<p>For Constructing 6" Reinforced Monolithic Concrete Curb</p> <p>complete in place, the sum of _____</p> <p><u>Thirty</u> Dollars</p> <p>and <u>zero</u></p> <p>Cents per Linear Foot</p>	30.00	77,580.00
31	75	L.F.	<p>For Constructing 6" Reinforced Monolithic Concrete Rollover Curb</p> <p>complete in place, the sum of _____</p> <p><u>Forty Five</u> Dollars</p> <p>and <u>zero</u></p> <p>Cents per Linear Foot</p>	45.00	3,375.00
32	158	L.F.	<p>For Constructing 6" Reinforced Concrete Curb & Gutter</p> <p>complete in place, the sum of _____</p> <p><u>Fifty</u> Dollars</p> <p>and <u>zero</u></p> <p>Cents per Linear Foot</p>	50.00	7,900.00
33	48	L.F.	<p>For Constructing Concrete Street Header</p> <p>complete in place, the sum of _____</p> <p><u>Forty</u> Dollars</p> <p>and <u>zero</u></p> <p>Cents per Linear Foot</p>	40.00	1,920.00
34	2,819	S.F.	<p>For Furnishing and Placing 4-inch thick Reinforced Concrete Sidewalk Pavement</p> <p>complete in place, the sum of _____</p> <p><u>Eight</u> Dollars</p> <p>and <u>210</u></p> <p>Cents per Square Foot</p>	8.00	22,552.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
35	353	S.Y.	<p>For Furnishing and Placing 4" Crushed Limestone Flex Base</p> <p>complete in place, the sum of _____</p> <p><u>Twenty Five</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Square Yard</p>	25.00	8,825.00
36	311	S.Y.	<p>For Furnishing and Placing 4" HMAC Type "B" Base Course</p> <p>complete in place, the sum of _____</p> <p><u>Forty Two</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Square Yard</p>	42.00	13,062.00
37	311	S.Y.	<p>For Furnishing and Placing 2" HMAC Type "D" Surface Course</p> <p>complete in place, the sum of _____</p> <p><u>Twenty Three</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Square Yard</p>	23.00	7,153.00
38	62	GAL	<p>For Furnishing and Placing Emulsion Asphalt Membrane (MS-2) (0.2 Gal/SY)</p> <p>complete in place, the sum of _____</p> <p><u>Fifty Two</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Gallon</p>	52.00	3,224.00
39	315	S.F.	<p>For Furnishing, Laying and Compacting Short Term Asphalt Pavement Repair</p> <p>complete in place, the sum of _____</p> <p><u>Eleven</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Square Foot</p>	11.00	3,465.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
40	1,530	C.Y.	<p>For Furnishing and Placement of Topsoil Placement to a Depth of 6"</p> <p>complete in place, the sum of _____</p> <p><u>Forty</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Cubic Yard</p>	40.00	61,200.00
41	83	S.F.	<p>For Furnishing and Installing Pavestone ADA Truncated Dome Concrete Paver, Running Bond Pattern, 2-3/8" Thickness, Bellows Brown Color</p> <p>complete in place, the sum of _____</p> <p><u>Eleven</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Square Foot</p>	11.00	913.00
42	345	S.F.	<p>For Furnishing and Installing Pavestone Concrete Street Paver, Running Bond Pattern, 3-1/8" Thickness, Bellows Brown Color</p> <p>complete in place, the sum of _____</p> <p><u>Twelve</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Square Foot</p>	12.00	4,140.00
43	4	EA.	<p>For Furnishing and Installing White Thermoplastic "ARROW" Pavement Marking</p> <p>complete in place, the sum of _____</p> <p><u>Six Hundred</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	600.00	2,400.00
44	2	EA.	<p>For Furnishing and Installing White Thermoplastic "ONLY" Pavement Marking</p> <p>complete in place, the sum of _____</p> <p><u>Seven Hundred</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	700.00	1,400.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
45	320	L.F.	<p>For Furnishing and Installing 4-Inch Wide White Solid Thermoplastic Pavement Marking</p> <p>complete in place, the sum of _____</p> <p>_____ Dollars</p> <p>and _____</p> <p>Cents per Linear Foot</p>	4.00	1,280.00
46	305	L.F.	<p>For Furnishing and Installing 8-Inch Wide Yellow Solid Thermoplastic Pavement Marking</p> <p>complete in place, the sum of _____</p> <p>_____ Dollars</p> <p>and _____</p> <p>Cents per Linear Foot</p>	8.00	2,440.00
47	86	L.F.	<p>For Furnishing and Installing 8-Inch Wide White Solid Thermoplastic Pavement Marking</p> <p>complete in place, the sum of _____</p> <p>_____ Dollars</p> <p>and _____</p> <p>Cents per Linear Foot</p>	8.00	688.00
48	48	L.F.	<p>For Furnishing and Installing 24-Inch Wide White Solid Thermoplastic Pavement Marking (Stop Bar)</p> <p>complete in place, the sum of _____</p> <p>_____ Dollars</p> <p>and _____</p> <p>Cents per Linear Foot</p>	24.00	1,152.00
49	91	L.F.	<p>For Furnishing and Installing 12-Inch Wide White Solid Thermoplastic Pavement Marking (Crosswalk)</p> <p>complete in place, the sum of _____</p> <p>_____ Dollars</p> <p>and _____</p> <p>Cents per Linear Foot</p>	12.00	1,092.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
50	16	EA.	<p>For Furnishing and Installing Type 11-AA-4 ReflectORIZED Pavement Marker</p> <p>complete in place, the sum of _____</p> <p>_____ Dollars</p> <p>and _____</p> <p>Cents per Each</p>	6.00	96.00
51	5	EA.	<p>For Furnishing and Installing Type 1-C-4 ReflectORIZED Pavement Marker</p> <p>complete in place, the sum of _____</p> <p>_____ Dollars</p> <p>and _____</p> <p>Cents per Each</p>	6.00	75 30.00
52	7	EA.	<p>For Furnishing and Installing Type 11 ReflectORIZED Blue Pav't Markers for Hydrants</p> <p>complete in place, the sum of _____</p> <p>_____ Dollars</p> <p>and _____</p> <p>Cents per Each</p>	6.00	42.00
53	2	EA.	<p>For Furnishing and Installing Stop Sign (R1-1)</p> <p>complete in place, the sum of _____</p> <p>_____ Dollars</p> <p>and _____</p> <p>Cents per Each</p>	400.00	800.00
54	1	EA.	<p>For Furnishing and Installing Stop Sign (R1-1) Complete with Two Street Name Signs and Mount per Vitruvian Park Standards</p> <p>complete in place, the sum of _____</p> <p>_____ Dollars</p> <p>and _____</p> <p>Cents per Each</p>	500.00	500.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
55	2	EA.	<p>For Furnishing and Installing Speed Limit Sign (R2-1)</p> <p>complete in place, the sum of _____</p> <p><u>Three Hundred</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	300.00	600.00
56	285	L.F.	<p>For Excavation of Earthen Drainage Swale</p> <p>complete in place, the sum of _____</p> <p><u>Fifteen</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	15.00	4,275.00
57	1	EA.	<p>For Removal of Plug and Connecting Proposed Pipe to Existing 24-Inch Storm Sewer Pipe</p> <p>complete in place, the sum of _____</p> <p><u>Two Thousand</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	2,000.00	2,000.00
58	1	EA.	<p>For Constructing Standard 5' Type "B" Square Storm Drain Manhole over Existing 39" RCP</p> <p>complete in place, the sum of _____</p> <p><u>Seven Thousand</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	7,000.00	7,000.00
59	7	EA.	<p>For Constructing Standard 4' Type "A" Square Storm Drain Manhole</p> <p>complete in place, the sum of _____</p> <p><u>Six Thousand</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	6,000.00	42,000.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
60	1	EA.	<p>For Constructing Standard 3' Square Drop Inlet with 2' Concrete Apron</p> <p>complete in place, the sum of _____</p> <p><u>Seven thousand</u> Dollars</p> <p>and <u>zero</u></p> <p>Cents per Each</p>	7,000.00	7,000.00
61	2	EA.	<p>For Constructing 10' Standard Curb Inlet</p> <p>complete in place, the sum of _____</p> <p><u>Ten thousand</u> Dollars</p> <p>and <u>zero</u></p> <p>Cents per Each</p>	10,000.00	20,000.00
62	6	EA.	<p>For Constructing 6' Standard Curb Inlet</p> <p>complete in place, the sum of _____</p> <p><u>Nine thousand</u> Dollars</p> <p>and <u>zero</u></p> <p>Cents per Each</p>	9,000.00	54,000.00
63	475	L.F.	<p>For Furnishing and Installing 30-Inch Reinforced Concrete Pipe (Class III)</p> <p>complete in place, the sum of _____</p> <p><u>One Hundred Twenty</u> Dollars</p> <p>and <u>zero</u></p> <p>Cents per Linear Foot</p>	120.00	57,000.00
64	309	L.F.	<p>For Furnishing and Installing 27-Inch Reinforced Concrete Pipe (Class III)</p> <p>complete in place, the sum of _____</p> <p><u>One Hundred Ten</u> Dollars</p> <p>and <u>zero</u></p> <p>Cents per Linear Foot</p>	110.00	33,990.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
65	513	L.F.	<p>For Furnishing and Installing 24-Inch Reinforced Concrete Pipe (Class III)</p> <p>complete in place, the sum of _____</p> <p><u>One Hundred Six</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	106.00	54,378.00
66	692	L.F.	<p>For Furnishing and Installing 18-Inch Reinforced Concrete Pipe (Class III)</p> <p>complete in place, the sum of _____</p> <p><u>One Hundred</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	100.00	69,200.00
67	1	EA.	<p>For Furnishing and Installing Concrete Plug for 24-Inch Reinforced Concrete Pipe (Class III)</p> <p>complete in place, the sum of _____</p> <p><u>Eighty</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	80.00	80.00
68	16	EA.	<p>For Furnishing and Installing Concrete Plug for 18-Inch Reinforced Concrete Pipe (Class III)</p> <p>complete in place, the sum of _____</p> <p><u>Sixty</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	60.00	960.00
69	1,989	L.F.	<p>For TV Inspection of Storm Drain System</p> <p>complete in place, the sum of _____</p> <p><u>Five</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	5.00	9,945.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
70	1	L.S.	<p>For Preparing, Furnishing, Installing and Maintaining Trench Safety System for Storm Drain Improvements</p> <p>complete in place, the sum of _____</p> <p><u>Ten Thousand</u> Dollars</p> <p>and <u>zero</u></p> <p>Cents per Lump Sum</p>	10,000.00	10,000.00
71	837	L.F.	<p>For Removal and Disposal of Existing 8" Water Line</p> <p>complete in place, the sum of _____</p> <p><u>Eighteen</u> Dollars</p> <p>and <u>zero</u></p> <p>Cents per Linear Foot</p>	18.00	15,066.00
72	5	L.F.	<p>For Removal and Disposal of Existing 6" Water Line</p> <p>complete in place, the sum of _____</p> <p><u>Seventeen</u> Dollars</p> <p>and <u>zero</u></p> <p>Cents per Linear Foot</p>	17.00	85.00
73	1	EA.	<p>For Removal of Plug & Blocking and Connection to Existing 12-inch Water Pipe</p> <p>complete in place, the sum of _____</p> <p><u>Two Thousand</u> Dollars</p> <p>and <u>zero</u></p> <p>Cents per Each</p>	2,000.00	2,000.00
74	7	EA.	<p>For Removal and Disposal of Existing Meter Boxes and Service Lines</p> <p>complete in place, the sum of _____</p> <p><u>One Hundred</u> Dollars</p> <p>and <u>zero</u></p> <p>Cents per Each</p>	100.00	700.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
75	2	EA.	<p>For Removal of 45 Degree Bend & Blocking and Connection to Existing 8-inch Water Pipe</p> <p>complete in place, the sum of _____</p> <p><u>Two Thousand</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	2,000.00	4,000.00
76	3	EA.	<p>For Connection to Existing 8" Water Pipe</p> <p>complete in place, the sum of _____</p> <p><u>Two Thousand</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	2,000.00	6,000.00
77	1	EA.	<p>For Removal and Salvaging of Existing Fire Hydrant Assembly</p> <p>complete in place, the sum of _____</p> <p><u>Five Hundred</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	500.00	500.00
78	687	L.F.	<p>For Furnishing and Installing 12-Inch PVC Water Pipe by Open Cut with Std. Embedment</p> <p>complete in place, the sum of _____</p> <p><u>Eighty</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	80.00	54,960.00
79	20	L.F.	<p>For Furnishing and Installing 12-Inch Ductile Iron Water Pipe by Open Cut with Std. Embedment</p> <p>complete in place, the sum of _____</p> <p><u>One Hundred Eighty</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	180.00	3,600.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
80	1,510	L.F.	<p>For Furnishing and Installing 8-Inch PVC Water Pipe by Open Cut with Std. Embedment</p> <p>complete in place, the sum of _____</p> <p><u>Seventy</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	70.00	105,700.00
81	102	L.F.	<p>For Furnishing and Installing 8-Inch Ductile Iron Water Pipe by Open Cut with Std. Embedment</p> <p>complete in place, the sum of _____</p> <p><u>One Hundred Thirty</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	130.00	13,260.00
82	46	L.F.	<p>For Furnishing and Installing 6-Inch PVC Water Pipe by Open Cut with Std. Embedment</p> <p>complete in place, the sum of _____</p> <p><u>Seventy</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	70.00	3,220.00
83	33	L.F.	<p>For Furnishing and Installing 4" PVC Water Pipe by Open Cut with Std. Embedment</p> <p>complete in place, the sum of _____</p> <p><u>Sixty Five</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	65.00	2,145.00
84	106	L.F.	<p>For Furnishing and Installing 2" CU Water Pipe by Open Cut with Std. Embedment</p> <p>complete in place, the sum of _____</p> <p><u>Forty</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	40.00	4,240.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
85	51	L.F.	<p>For Furnishing and Installing 1 1/2" CU Water Pipe by Open Cut with Std. Embedment</p> <p>complete in place, the sum of _____</p> <p><u>Forty</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	40.00	2,040.00
86	8	EA.	<p>For Furnishing and Installing 12-Inch Gate Valve Complete w/ Valve Box, Extention, Collar, Debris Cap and Cover</p> <p>complete in place, the sum of _____</p> <p><u>Two Thousand Four Hundred</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	2,400.00	19,200.00
87	21	EA.	<p>For Furnishing and Installing 8-Inch Gate Valve Complete w/ Valve Box, Extention, Collar, Debris Cap and Cover</p> <p>complete in place, the sum of _____</p> <p><u>Sixteen Hundred</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	1,600.00	33,600.00
88	7	EA.	<p>For Furnishing and Installing 6-Inch Gate Valve Complete w/ Valve Box, Extention, Collar, Debris Cap and Cover</p> <p>complete in place, the sum of _____</p> <p><u>Eleven Hundred</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	1,100.00	7,700.00
89	1	EA.	<p>For Furnishing and Installing 4-Inch Gate Valve Complete w/ Valve Box, Extention, Collar, Debris Cap and Cover</p> <p>complete in place, the sum of _____</p> <p><u>Nine Hundred</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	900.00	900.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
90	7	EA.	<p>For Furnishing and Installing Fire Hydrant Assembly, Complete in Place</p> <p>complete in place, the sum of _____</p> <p><u>Thirty Five Hundred</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	3,500.00	24,500.00
91	6.80	TONS	<p>For Furnishing and Installing Ductile Iron Full Bodied Mechanical Joint Type Fittings w/ Restraining Glands for Water Pipe</p> <p>complete in place, the sum of _____</p> <p><u>Eight Thousand</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Ton</p>	8,000.00	54,400.00
92	5	EA.	<p>For Furnishing and Installing 2" Water Service Tap</p> <p>complete in place, the sum of _____</p> <p><u>Five Hundred</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	500.00	2,500.00
93	2	EA.	<p>For Furnishing and Installing 1 1/2" Water Service Tap</p> <p>complete in place, the sum of _____</p> <p><u>Four Hundred</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	400.00	800.00
94	1	EA.	<p>For Furnishing and Installing 2" Meter and Meter Box</p> <p>complete in place, the sum of _____</p> <p><u>Two Thousand</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	2,000.00	2,000.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
95	3	EA.	For Furnishing and Installing 2" Meter Box complete in place, the sum of _____ <u>Seven Hundred</u> Dollars and <u>Zero</u> Cents per Each	700.00	2,100.00
96	2	EA.	For Furnishing and Installing 1 1/2" Meter Box complete in place, the sum of _____ <u>Six Hundred</u> Dollars and <u>Zero</u> Cents per Each	600.00	1,200.00
97	2	EA.	For Reconnection of Exist Domestic/Irrigation Water Services to New 12" Water Pipe complete in place, the sum of _____ <u>One Thousand Three Hundred</u> Dollars and <u>Zero</u> Cents per Each	1,300.00	2,600.00
98	37	EA.	For Final Adjustment of Existing Water Valves to Finish Grade complete in place, the sum of _____ <u>One Hundred</u> Dollars and <u>Zero</u> Cents per Each	100.00	3,700.00
99	1	EA.	For Furnishing and Installing Automatic Flushing Device, Kupferle 9800i - Genesis or Approved Equal complete in place, the sum of _____ <u>Twenty Four Thousand</u> Dollars and <u>Zero</u> Cents per Each	24,000.00	24,000.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
100	1	L.S.	<p>For Preparing, Furnishing, Installing and Maintaining Trench Safety System for Water Line Improvements</p> <p>complete in place, the sum of _____</p> <p><u>Three Thousand</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Lump Sum</p>	3,000.00	3,000.00
101	3	EA.	<p>For Connection to Existing Sanitary Sewer Manhole</p> <p>complete in place, the sum of _____</p> <p><u>Two Thousand</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	2,000.00	6,000.00
102	1	EA.	<p>For Abandonment of Existing Sanitary Sewer Manhole per Town of Addison Requirements</p> <p>complete in place, the sum of _____</p> <p><u>Two Thousand</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	2,000.00	2,000.00
103	898	L.F.	<p>For Cutting and Filling of Existing 8" Sewer Pipe with Flowable Fill (NTCOG 504.2.3.4)</p> <p>complete in place, the sum of _____</p> <p><u>Seven</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	7.00	6,286.00
104	1,334	L.F.	<p>For Furnishing and Installing 10-Inch PVC Sanitary Sewer Pipe by Open Cut with Std. Embedment</p> <p>complete in place, the sum of _____</p> <p><u>Eighty</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	80.00	106,720.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
105	25	L.F.	<p>For Furnishing and Installing 10-Inch PVC Sanitary Sewer Pipe by Open Cut with Cement Stabilized Sand Embedment</p> <p>complete in place, the sum of _____</p> <p><u>One Hundred Twenty</u> Dollars and <u>Zero</u></p> <p>Cents per Linear Foot</p>	120.00	3,000.00
106	18	L.F.	<p>For Furnishing and Installing 10-Inch PVC Sanitary Sewer Pipe with 18" Steel Encasement Pipe (0.375" thickness) by Open Cut with Std. Embedment</p> <p>complete in place, the sum of _____</p> <p><u>Two Hundred Thirty</u> Dollars and <u>Zero</u></p> <p>Cents per Linear Foot</p>	230.00 4,140.00	4,140.00
107	40	L.F.	<p>For Furnishing and Installing 10-Inch PVC Sanitary Sewer Pipe with 18" Steel Encasement Pipe (0.375" thickness) by Other Than Open Cut</p> <p>complete in place, the sum of _____</p> <p><u>Three Hundred Ninety</u> Dollars and <u>Zero</u></p> <p>Cents per Linear Foot</p>	390.00	15,600.00
108	523	L.F.	<p>For Furnishing and Installing 8-Inch PVC Sanitary Sewer Pipe by Open Cut with Std. Embedment</p> <p>complete in place, the sum of _____</p> <p><u>Eighty</u> Dollars and <u>Zero</u></p> <p>Cents per Linear Foot</p>	80.00	41,840.00
109	41	L.F.	<p>For Furnishing and Installing 8-Inch PVC Sanitary Sewer Pipe by Open Cut with Cement Stabilized Sand Embedment</p> <p>complete in place, the sum of _____</p> <p><u>One Hundred Thirty</u> Dollars and <u>Zero</u></p> <p>Cents per Linear Foot</p>	130.00	5,330.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
110	54	L.F.	<p>For Furnishing and Installing 8-Inch PVC Sanitary Sewer Pipe with 18" Steel Encasement Pipe (0.375" thickness) by Open Cut with Std. Embedment</p> <p>complete in place, the sum of _____</p> <p><u>Two Hundred Ninety</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	290.00	15,660.00
111	95	L.F.	<p>For Furnishing and Installing 8-Inch PVC Sanitary Sewer Pipe with 18" Steel Encasement Pipe (0.375" thickness) by Other Than Open Cut</p> <p>complete in place, the sum of _____</p> <p><u>Three Hundred Eighty</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	380.00	36,100.00
112	46	L.F.	<p>For Furnishing and Installing 6-Inch PVC Sanitary Sewer Pipe by Open Cut with Std. Embedment</p> <p>complete in place, the sum of _____</p> <p><u>Seventy Five</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	75.00	3,450.00
113	9	L.F.	<p>For Furnishing and Installing 4-Inch PVC Sanitary Sewer Pipe by Open Cut with Std. Embedment</p> <p>complete in place, the sum of _____</p> <p><u>Seventy</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	70.00	630.00
114	14	EA.	<p>For Furnishing and Installing Sanitary Sewer Lateral Cleanouts</p> <p>complete in place, the sum of _____</p> <p><u>One Thousand</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	1,000.00	14,000.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
115	1	EA.	<p>For Installing 4" Service Taps</p> <p>complete in place, the sum of _____</p> <p><u>Three Hundred</u> Dollars</p> <p>and <u>zero</u></p> <p>Cents per Each</p>	300.00	300.00
116	1	EA.	<p>For Constructing Standard 4' Diameter Sanitary Sewer Manhole to 6' Depth with Standard Frame and Cover, over Existing Sewer Lines</p> <p>complete in place, the sum of _____</p> <p><u>Six thousand</u> Dollars</p> <p>and <u>zero</u></p> <p>Cents per Each</p>	6,000.00	6,000.00
117	10	EA.	<p>For Constructing Standard 4' Diameter Sanitary Sewer Manhole to 6' Depth with Standard Frame and Cover</p> <p>complete in place, the sum of _____</p> <p><u>Four thousand</u> Dollars</p> <p>and <u>zero</u></p> <p>Cents per Each</p>	4,000.00	40,000.00
118	24	V.F.	<p>For Extra Depth for Standard 4' Diameter Manhole in Excess of 6' Depth</p> <p>complete in place, the sum of _____</p> <p><u>Two hundred</u> Dollars</p> <p>and <u>zero</u></p> <p>Cents per Vertical Feet</p>	200.00	4,800.00
119	1	EA.	<p>For Constructing Standard 5' Diameter Internal Drop Sanitary Sewer Manhole to 6' Depth with Standard Frame and Cover</p> <p>complete in place, the sum of _____</p> <p><u>Six thousand</u> Dollars</p> <p>and <u>zero</u></p> <p>Cents per Each</p>	6,000.00	6,000.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
120	4	V.F.	<p>For Extra Depth for Standard 5' Diameter Internal Drop Manhole in Excess of 6' Depth</p> <p>complete in place, the sum of _____</p> <p><u>Two Hundred Fifty</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Vertical Feet</p>	250.00	1,000.00
121	12	EA.	<p>For Final Adjustment of Sanitary Sewer Manholes to Finish Grade</p> <p>complete in place, the sum of _____</p> <p><u>Three Hundred</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	300.00	3,600.00
122	631	S.Y.	<p>For Sawcutting, Removal and Replacement of Concrete Street Pavement</p> <p>complete in place, the sum of _____</p> <p><u>One Hundred Fifty</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Square Yard</p>	150.00	94,650.00
123	2,185	L.F.	<p>For TV Inspection of Sanitary Sewer System</p> <p>complete in place, the sum of _____</p> <p><u>3 Three</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	3.00	6,555.00
124	1	L.S.	<p>For Preparing, Furnishing, Installing and Maintaining Trench Safety System for Sewer Line Improvements</p> <p>complete in place, the sum of _____</p> <p><u>Ten Thousand</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Lump Sum</p>	10,000.00	10,000.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
125	31	EA.	<p>For Furnishing and Installation of Street Light Pole, Type 1, Single 100W 240V MH Luminare on 11'-8" Pole, Color Silver, Complete in Place (Reference Special Provision 84)</p> <p>complete in place, the sum of _____</p> <p><u>Thirty Five Hundred</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	3,500.00	108,500.00
126	31	EA.	<p>For Concrete Drilled Shaft Foundation, Type 1, Complete in Place</p> <p>complete in place, the sum of _____</p> <p><u>Six Hundred</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	600.00	18,600.00
127	8	L.F.	<p>For Furnishing and Installation of 2" Schedule 40 PVC Conduit</p> <p>complete in place, the sum of _____</p> <p><u>Thirty</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	30.00	240.00
128	2,137	L.F.	<p>For Furnishing and Installation of 1 1/4" Schedule 40 PVC Conduit</p> <p>complete in place, the sum of _____</p> <p><u>Twenty Five</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	25.00	53,245.00
129	4,870	L.F.	<p>For Furnishing and Installation of Electric Conductor (No. 6 CU) XHHW-2 Insulated</p> <p>complete in place, the sum of _____</p> <p><u>One</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	1.00	4,870.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
130	2,435	L.F.	<p>For Furnishing and Installation of Electric Conductor (No. 10 CU) XHHW-2 Insulated</p> <p>complete in place, the sum of _____</p> <p><u>Two</u> _____ Dollars</p> <p>and <u>zero</u> _____</p> <p>Cents per Linear Foot</p>	2.00	4,870.00
131	1	EA.	<p>For Connection to Existing Street Light Circuit</p> <p>complete in place, the sum of _____</p> <p><u>Two Thousand</u> _____ Dollars</p> <p>and <u>zero</u> _____</p> <p>Cents per Each</p>	2,000.00	2,000.00
132	3	EA.	<p>For Connection to Existing Street Light Conduits</p> <p>complete in place, the sum of _____</p> <p><u>Five Hundred</u> _____ Dollars</p> <p>and <u>zero</u> _____</p> <p>Cents per Each</p>	500.00	1,500.00
133	2	EA.	<p>For Furnishing and Installation of Ground Box, Type A</p> <p>complete in place, the sum of _____</p> <p><u>One thousand</u> _____ Dollars</p> <p>and <u>zero</u> _____</p> <p>Cents per Each</p>	1,000.00	2,000.00
134	229	L.F.	<p>For Furnishing and Installation of 1-6" and 1-2" Schedule 40 PVC Irrigation Conduits</p> <p>complete in place, the sum of _____</p> <p><u>Thirty</u> _____ Dollars</p> <p>and <u>zero</u> _____</p> <p>Cents per Linear Foot</p>	30.00	6,870.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
135	1	EA.	<p>For Furnishing and Installation of Electric Service Pedestal, Type PS, 120/240 V, Single Phase Electric Service, Milbank CP3B A-Size or Approved Equal, with 200 Amp Panel and Main Breaker, Lighting Control with HOA Switch, Photo Electric Controlled with Distribution Blocks, Complete in Place</p> <p>complete in place, the sum of _____</p> <p><u>Five Thousand</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	5,000.00	5,000.00
136	8	L.F.	<p>For Furnishing and Constructing 8E6 Duct Bank Structure per Oncor Electric Delivery</p> <p>complete in place, the sum of _____</p> <p><u>Four Hundred Ten</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	410.00	3,280.00
137	1,596	L.F.	<p>For Furnishing and Constructing 6E6 Duct Bank Structure per Oncor Electric Delivery</p> <p>complete in place, the sum of _____</p> <p><u>One Hundred Eighty</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	180.00	287,280.00
138	839	L.F.	<p>For Furnishing and Constructing 4E6 Duct Bank Structure with (2) -3" conduits above per Oncor Electric Delivery</p> <p>complete in place, the sum of _____</p> <p><u>One Hundred Seventy</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	170.00	142,630.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
139	209	L.F.	<p>For Furnishing and Constructing 2E6 Duct Bank Structure per Oncor Electric Delivery</p> <p>complete in place, the sum of _____</p> <p><u>One Hundred Fifty</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	150.00	31,350.00
140	1	EA.	<p>For Furnishing and Constructing 4 Way Electrical Manhole per Oncor Electric Delivery</p> <p>complete in place, the sum of _____</p> <p><u>Twenty Three Thousand</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	23,000.00	23,000.00
141	5	EA.	<p>For Furnishing and Constructing 3 Way Electrical Manhole per Oncor Electric Delivery</p> <p>complete in place, the sum of _____</p> <p><u>Twenty Two Thousand</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	22,000.00	110,000.00
142	1	EA.	<p>For Furnishing and Constructing 2 Way Electrical Manhole per Oncor Electric Delivery</p> <p>complete in place, the sum of _____</p> <p><u>Twenty One Thousand</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	21,000.00	21,000.00
143	3	EA.	<p>For Constructing Manhole Entrance Pad per Oncor Electric Delivery</p> <p>complete in place, the sum of _____</p> <p><u>Five Hundred</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	500.00	1,500.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
144	7	EA.	<p>For Final Adjustment of Electrical Manhole to Finish Grade</p> <p>complete in place, the sum of _____</p> <p><u>Two Hundred</u> _____ Dollars</p> <p>and <u>Zero</u> _____</p> <p>Cents per Each</p>	200.00	1,400
145	2	EA.	<p>For End and Plugging of Electrical Duct Bank Structure per Oncor Electric Delivery</p> <p>complete in place, the sum of _____</p> <p><u>Two Hundred</u> _____ Dollars</p> <p>and <u>Zero</u> _____</p> <p>Cents per Each</p>	200.00	400.00
146	1	EA.	<p>For Concrete Transformer Pad (Type 2) for Single Phase Transformer per Oncor Electric Delivery</p> <p>complete in place, the sum of _____</p> <p><u>Three Thousand</u> _____ Dollars</p> <p>and <u>Zero</u> _____</p> <p>Cents per Each</p>	3,000.00	3,000.00
147	7	EA.	<p>For Concrete Deepwell Pad for 4 Way 25KV Deadfront Switchgear per Oncor Electric Delivery</p> <p>complete in place, the sum of _____</p> <p><u>Four Thousand</u> _____ Dollars</p> <p>and <u>Zero</u> _____</p> <p>Cents per Each</p>	4,000.00	28,000.00
148	81	L.F.	<p>For Furnishing and Installation of (2) - 4" Electrical Duct by Open Cut</p> <p>complete in place, the sum of _____</p> <p><u>One Hundred</u> _____ Dollars</p> <p>and <u>Zero</u> _____</p> <p>Cents per Linear Foot</p>	100.00	8,100.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
149	140	L.F.	For Furnishing and Installation of (2) - 3" Electrical Duct by Open Cut complete in place, the sum of _____ _____ Dollars and <u>Six</u> _____ _____ Cents per Linear Foot	60.00	8,400.00
150	100	L.F.	For Furnishing and Installation of (2) - 3" Electrical Duct by Other Than Open Cut complete in place, the sum of _____ _____ Dollars and <u>One Hundred</u> _____ _____ Cents per Linear Foot	100.00	10,000.00
151	630	S.F.	For Sawcutting, Removal & Replacement of Asphalt Street Pavement Repair complete in place, the sum of _____ _____ Dollars and <u>Twenty</u> _____ _____ Cents per Square Foot	20.00	12,600.00
152	1	L.S.	For Preparing, Furnishing, Installing and Maintaining Trench Safety System for Duct Bank Improvements complete in place, the sum of _____ _____ Dollars and <u>Six thousand</u> _____ _____ Cents per Lump Sum	6,000.00	6,000.00
153	1	L.S.	For Furnishing all Labor and Materials necessary to Repair the Existing Irrigation System along Westgate Lane (Ref. Note 29 - Sheet 90) complete in place, the sum of _____ _____ Dollars and <u>Nineteen thousand</u> _____ _____ Cents per Lump Sum	19,000.00	19,000.00

BASE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
154	1	L.S.	For Furnishing all Labor and Materials necessary to Repair the Existing Irrigation System along Vitruvian Way (Ref. Note 29 - Sheet 90) complete in place, the sum of _____ <u>Ten thousand</u> Dollars and <u>zero</u> Cents per Lump Sum	10,000.00	10,000.00
155	1	L.S.	For Furnishing all Labor and Materials necessary to Repair the Existing Irrigation System along Marsh Lane (Ref. Note 29 - Sheet 90) complete in place, the sum of _____ <u>Twenty thousand</u> Dollars and <u>zero</u> Cents per Lump Sum	20,000.00	20,000.00
TOTAL AMOUNT OF BASE BID (Items 1 Through 155)					3,197,299.00

ADDITIVE ALTERNATE

The following Additive Alternate will be added to the bid at the option of the Town of Addison

ADDITIVE ALTERNATE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
156	1	L.S.	For Mobilization (not to exceed 5% of total bid amount) complete in place, the sum of _____ <u>Twenty Eight Thousand</u> Dollars and <u>300</u> Cents per Lump Sum	28,000.00	28,000.00
157	10,092	S.F.	Furnishing & Placing 4-inch thick Reinforced Concrete Sidewalk Enhanced Pvmt complete in place, the sum of _____ <u>Thirteen</u> Dollars and <u>300</u> Cents per Square Foot	13.00	131,196.00
158	47	S.F.	For Furnishing & Installing Pavestone ADA Truncated Dome Concrete Paver, Running Bond Pattern, 2-3/8" Thickness, Bellow Brown Color complete in place, the sum of _____ <u>Eleven</u> Dollars and <u>200</u> Cents per Square Foot	11.00	517.00
159	103	S.F.	For Furnishing & Installing Pavestone Concrete Street Paver, City Stone 1, 3-1/8" Thickness, Bellows Brown Color complete in place, the sum of _____ <u>Twelve</u> Dollars and <u>200</u> Cents per Square Foot	12.00	1,236.00

ADDITIVE ALTERNATE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
160	1,894	S.F.	<p>For Furnishing & Installing Pavestone Concrete Paver - Holland Stone, 2-3/8" Thickness, Bellows Brown Color</p> <p>complete in place, the sum of _____</p> <p><u>Four</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Square Foot</p>	4.00	7,576.00
161	14	EA.	<p>For Furnishing and Installing PEDOC, 30" Height, Single Gang, Hinged Top Pedestal with Integral Base, Color Green, Complete in Place</p> <p>complete in place, the sum of _____</p> <p><u>Six Hundred</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	600.00	8,400.00
162	1,528	L.F.	<p>For Furnishing and Installing 3/4" Schedule 40 PVC Conduit</p> <p>complete in place, the sum of _____</p> <p><u>Twenty Three</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Linear Foot</p>	23.00	35,144.00
163	6	EA.	<p>For Furnishing and Installing Ground Box Type "A"</p> <p>complete in place, the sum of _____</p> <p><u>One Thousand</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	1,000.00	6,000.00
164	4	EA.	<p>For Connecting Proposed Tree Drain Line to Storm Drain Curb Inlet</p> <p>complete in place, the sum of _____</p> <p><u>Fifteen Hundred</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	1,500.00	6,000.00

ADDITIVE ALTERNATE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
165	959	L.F.	<p>For Furnishing and Installing 4" PVC (SDR-35) Tree Drain Piping</p> <p>complete in place, the sum of _____</p> <p>_____ Dollars</p> <p>and _____</p> <p>Cents per Linear Foot</p>	25.00	23,975.00
166	1.25	Acres	<p>For Furnishing and Installing Hydromulch Seeding (NCTCOG Item 3.10. "Seeding") of Disturbed Areas as shown on Sheets 83-85, and including all other Disturbed Areas of the Site (Ref. Special Provision 74)</p> <p>complete in place, the sum of _____</p> <p>_____ Dollars</p> <p>and _____</p> <p>Cents per Acre</p>	3,200.00	4,000.00
167	4,650	S.F.	<p>For Furnishing and Installing Midiron Bermuda Sod (Pinned on Slopes Greater than 6:1)</p> <p>complete in place, the sum of _____</p> <p>_____ Dollars</p> <p>and _____</p> <p>Cents per Square Foot</p>	0.50	2,325.00
168	3,530	EA.	<p>For Furnishing & Installing Liriope, 1 gallon, Planted 12" O.C.</p> <p>complete in place, the sum of _____</p> <p>_____ Dollars</p> <p>and _____</p> <p>Cents per Each</p>	13.00	45,890.00
169	3,655	S.F.	<p>For Preparation of Planting Bed Areas including Topsoil, Soil Amendment Materials and Mulch</p> <p>complete in place, the sum of _____</p> <p>_____ Dollars</p> <p>and _____</p> <p>Cents per Square Foot</p>	2.00	7,310.00

ADDITIVE ALTERNATE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
170	43	EA.	<p>For Furnishing and Installing "High Rise" Live Oak, 6" Caliper, Single Trunk, (See SP-85)</p> <p>complete in place, the sum of _____</p> <p><u>Forty five Hundred</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	4,500.00	193,500.00
171	1	L.S.	<p>For Implementation of Landscape Maintenance Program for a Period of One (1) Year From Date of Final Acceptance (Ref. Special Provision 118)</p> <p>complete in place, the sum of _____</p> <p><u>Fifty Five Thousand</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Lump Sum</p>	55,000.00	55,000.00
172	1	EA.	<p>For Furnishing and Installing 2" Irrigation Service Connection including Isolation Valve, Wye Strainer, Double Check Assembly, Master Valve and Flow Meter</p> <p>complete in place, the sum of _____</p> <p><u>Twenty Five Hundred</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Each</p>	2,500.00	2,500.00
173	1	L.S.	<p>For Furnishing and Installing Streetscape Irrigation System along Westgate Lane</p> <p>complete in place, the sum of _____</p> <p><u>Twenty Six Thousand</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Lump Sum</p>	26,000.00	26,000.00
174	1	L.S.	<p>For Furnishing and Installing Streetscape Irrigation System along Vitruvian Way</p> <p>complete in place, the sum of _____</p> <p><u>Five thousand</u> Dollars</p> <p>and <u>Zero</u></p> <p>Cents per Lump Sum</p>	5,000.00	5,000.00

ADDITIVE ALTERNATE BID

ITEM NO.	APPROX QUANT.	UNIT	DESCRIPTION OF ITEMS BID PRICE WRITTEN IN WORDS	UNIT PRICE	TOTAL PRICE
175	1	L.S.	For Furnishing and Installing Irrigation System for Hydromulch and Sod areas along Westgate Lane		
			complete in place, the sum of _____		
			<u>Twelve Thousand</u> Dollars	12,000.00	12,000.00
			and <u>Zero</u> Cents per Lump Sum		
176	1	L.S.	For Furnishing and Installing Irrigation System for Hydromulch and Sod areas along Vitruvian Way		
			complete in place, the sum of _____		
			<u>Twelve Thousand</u> Dollars	12,000.00	12,000.00
			and <u>Zero</u> Cents per Lump Sum		
177	3	E.A.	For Connection to Existing Irrigation System Mainline along Vitruvian Way		
			complete in place, the sum of _____		
			<u>Two Thousand</u> Dollars	2,000.00	6,000.00
			and <u>Zero</u> Cents per Each		
178	1	L.S.	For Furnishing all Labor and Materials necessary to Connect Proposed Irrigation System Wiring to the Existing Irrigation System Wiring and Controller along Vitruvian Way (Ref. Note 31 - Sheet 90)		
			complete in place, the sum of _____		
			<u>Seven Thousand</u> Dollars	7,000.00	7,000.00
			and <u>Zero</u> Cents per Lump Sum		
AMOUNT OF ADDITIVE ALTERNATE 1					626,569.00

VITRUVIAN PARK
PUBLIC INFRASTRUCTURE – BLOCK 200

BID SCHEDULE SUMMARY

<u>Bid Schedule & Description</u>	<u>Total Amount Materials & Services</u>
TOTAL AMOUNT OF BASE BID (Items 1 through 155)	<u>3,197,299.00</u>
WRITTEN IN WORDS:	<u>Three Million One Hundred Ninety Seven Two Hundred Ninety Nine</u>
TOTAL AMOUNT OF ADDITIVE ALTERNATE BID (Items 153 through 178)	<u>626,569.00</u>
WRITTEN IN WORDS:	<u>Six Hundred Twenty Six Thousand Five Hundred Sixty Nine</u>

NOTES:

1. All items, labor, materials, equipment, facilities, incidentals, and work required for construction of the project are to be provided and installed by the Contractor as part of the project and payment for the cost of such shall be included in the price bid.
2. Prices must be shown in words and figures for each item listed in this proposal. In the event of discrepancy, the words shall control.
3. It is understood that the Bid Security shall be collected and retained by the Owner as liquidated damages in the event a contract is made by the Owner based on this proposal within ninety (90) calendar days after receiving bids and the undersigned fails to execute the contract.
4. Materials, which are "tax exempt", are those items which are physically incorporated into the facilities constructed for the Town of Addison, as set forth in the Special Provisions. Materials include, but are not limited to purchased items such as water pipe, sanitary sewer pipe, storm drain pipe, etc. Services, which are "not tax exempt", are those items which are used by the Contractor but are not physically incorporated into the Town of Addison's facility and/or items which are consumed by construction, as set forth in the Special Provisions. Services include, but are not limited to, items such as supplies, tools, skill and labor, the purchase, rental or lease of equipment, etc.

EdUARdo M. Hernandez
Name of Person Signing Bid

[Signature]
Signature of Person Signing Bid

P.O. Box 600851 Dallas, TX
Address

214 390-2848
Telephone No. Fax No.

46-0730116
Bidder's Tax I.D. No. or Employer No.

If BIDDER is:

AN INDIVIDUAL

By _____ (Seal)
(Individual's Name)

doing business as _____

Business address: _____

Phone No. _____

A PARTNERSHIP

By _____ (Seal)
(Firm Name)

_____ (General Partner)

doing business as _____

Business address: _____

Phone No. _____

A CORPORATION

By Flow-Line Construction, Inc.
(Corporation Name)

Ohio
(State of Incorporation)

By Edwards de Hernandez
(Name of Person Authorized to Sign)

President
(Title)

(Corporate Seal)

Attest [Signature]
(Secretary)



Business address: P.O. Box 600881
Dallas TX 75360
75

Phone No. 214-390-2848

A JOINT VENTURE

By _____
(Name)

(Address)

By _____
(Name)

(Address)

(Each joint venture must sign. The manner of signing for each individual, partnership and corporation that is a party to the joint venture should be in the manner indicated above.)

SECTION IA

INDEMNIFICATION AGREEMENT

TOWN OF ADDISON
INDEMNIFICATION AGREEMENT

CONTRACTOR'S INDEMNITY OBLIGATION. CONTRACTOR COVENANTS, AGREES TO, AND SHALL DEFEND (WITH COUNSEL REASONABLY ACCEPTABLE TO OWNER), INDEMNIFY, AND HOLD HARMLESS OWNER, ITS PAST, PRESENT AND FUTURE ELECTED AND APPOINTED OFFICIALS, AND ITS PAST, PRESENT AND FUTURE OFFICERS, EMPLOYEES, REPRESENTATIVES, AND VOLUNTEERS, INDIVIDUALLY OR COLLECTIVELY, IN BOTH THEIR OFFICIAL AND PRIVATE CAPACITIES (COLLECTIVELY, THE "OWNER PERSONS" AND EACH BEING AN "OWNER PERSON") AND UDR, Inc., VPDEV 1 LLC, VP WEST 1 LLC, THEIR RESPECTIVE PAST, PRESENT AND FUTURE ELECTED AND APPOINTED OFFICIALS, AND EACH OF THEIR RESPECTIVE PAST, PRESENT AND FUTURE OFFICERS, EMPLOYEES, REPRESENTATIVES, AND VOLUNTEERS, INDIVIDUALLY OR COLLECTIVELY (COLLECTIVELY, "UDR" AND TOGETHER WITH THE OWNER PERSONS, THE "INDEMNIFIED PARTIES"), FROM AND AGAINST ANY AND ALL CLAIMS, LIABILITIES, JUDGMENTS, LAWSUITS, DEMANDS, HARM, LOSSES, DAMAGES, PROCEEDINGS, SUITS, ACTIONS, CAUSES OF ACTION, LIENS, FEES (INCLUDING ATTORNEY'S FEES), FINES, PENALTIES, EXPENSES, OR COSTS, OF ANY KIND AND NATURE WHATSOEVER, MADE UPON OR INCURRED BY OWNER AND/OR ANY OF THE INDEMNIFIED PARTIES, WHETHER DIRECTLY OR INDIRECTLY, (THE "CLAIMS"), THAT ARISE OUT OF, RESULT FROM, OR RELATE TO: (I) THE SERVICES TO BE PROVIDED BY CONTRACTOR PURSUANT TO THIS AGREEMENT, (II) ANY REPRESENTATIONS AND/OR WARRANTIES BY CONTRACTOR UNDER THIS AGREEMENT, (III) ANY PERSONAL INJURIES (INCLUDING BUT NOT LIMITED TO DEATH) TO ANY CONTRACTOR PERSONS (AS HEREINAFTER DEFINED) AND ANY THIRD PERSONS OR PARTIES, AND/OR (IV) ANY ACT OR OMISSION UNDER, IN PERFORMANCE OF, OR IN CONNECTION WITH THIS AGREEMENT BY CONTRACTOR OR BY ANY OF ITS OWNERS, DIRECTORS, OFFICERS, MANAGERS, PARTNERS, EMPLOYEES, AGENTS, CONTRACTORS, SUBCONTRACTORS, INVITEES, PATRONS, QUESTS, CUSTOMERS, LICENSEES, SUB LICENSEES, OR ANY OTHER PERSON OR ENTITY FOR WHOM CONTRACTOR IS LEGALLY RESPONSIBLE, AND THEIR RESPECTIVE OWNERS, DIRECTORS, OFFICERS, MANAGERS, PARTNERS, EMPLOYEES, AGENTS, CONTRACTORS, SUBCONTRACTORS, INVITEES, PATRONS, QUESTS, CUSTOMERS, LICENSEES, SUB LICENSEES (COLLECTIVELY, "CONTRACTOR PERSONS"). SUCH DEFENSE, INDEMNITY AND HOLD HARMLESS SHALL AND DOES INCLUDE CLAIMS ALLEGED OR FOUND TO HAVE BEEN CAUSED IN WHOLE OR IN PART BY THE NEGLIGENCE OR GROSS NEGLIGENCE OF OWNER OR ANY OTHER INDEMNIFIED PARTIES, OR CONDUCT BY OWNER OR ANY OTHER INDEMNIFIED PARTIES THAT WOULD GIVE RISE TO STRICT LIABILITY OF ANY KIND.

CONTRACTOR SHALL PROMPTLY ADVISE OWNER AND UDR, Inc. (AT 1745 SHEA CENTER DRIVE, SUITE 200, HIGHLANDS RANCH, CO 80129, ATTN: LEGAL) IN WRITING OF ANY CLAIM OR DEMAND AGAINST ANY INDEMNIFIED PARTIES RELATED TO OR ARISING OUT OF CONTRACTOR'S ACTIVITIES UNDER THIS AGREEMENT AND SHALL SEE TO THE INVESTIGATION AND DEFENSE WITHOUT RELIEVING CONTRACTOR OF ANY OF ITS OBLIGATIONS HEREUNDER. THIS DEFENSE, INDEMNITY, AND HOLD HARMLESS PROVISION SHALL SURVIVE THE TERMINATION OR EXPIRATION OF THIS AGREEMENT.


THE PROVISIONS IN THE FOREGOING DEFENSE, INDEMNITY AND HOLD HARMLESS ARE SEVERABLE, AND IF ANY PORTION, SENTENCE, PHRASE, CLAUSE OR WORD INCLUDED THEREIN SHALL FOR ANY REASON BE HELD BY A COURT OF COMPETENT JURISDICTION TO BE INVALID, ILLEGAL, VOID, OR UNENFORCEABLE IN ANY RESPECT, SUCH INVALIDITY, ILLEGALITY, VOIDNESS, OR UNENFORCEABILITY SHALL NOT AFFECT ANY OTHER PROVISION HEREOF, AND THIS DEFENSE, INDEMNITY AND HOLD HARMLESS PROVISION SHALL BE

CONSIDERED AS IF SUCH INVALID, ILLEGAL, VOID, OR UNENFORCEABLE PROVISION HAD NEVER BEEN CONTAINED IN THIS AGREEMENT. **IN THAT REGARD, IF THE CAPITALIZED LANGUAGE INCLUDED IN THE FOREGOING INDEMNITY IS SO DETERMINED TO BE VOID OR UNENFORCEABLE, THE PARTIES AGREE THAT:**

(i) THE FOREGOING DEFENSE, INDEMNITY, AND HOLD HARMLESS OBLIGATION OF CONTRACTOR SHALL BE TO THE EXTENT CLAIMS ARE CAUSED BY, ARISE OUT OF, OR RESULT FROM, IN WHOLE OR IN PART, ANY ACT OR OMISSION OF CONTRACTOR OR ANY CONTRACTOR PERSONS; AND

(ii) NOTWITHSTANDING THE PROVISIONS OF THE FOREGOING SUBPARAGRAPH (I), TO THE FULLEST EXTENT PERMITTED BY LAW, CONTRACTOR SHALL INDEMNIFY, HOLD HARMLESS, AND DEFEND OWNER AND THE INDEMNIFIED PARTIES FROM AND AGAINST ALL CLAIMS ARISING OUT OF OR RESULTING FROM BODILY INJURY TO, OR SICKNESS, DISEASE OR DEATH OF, ANY EMPLOYEE, AGENT OR REPRESENTATIVE OF CONTRACTOR OR ANY OF ITS SUBCONTRACTORS, REGARDLESS OF WHETHER SUCH CLAIMS ARE CAUSED, OR ARE ALLEGED TO BE CAUSED, IN WHOLE OR IN PART, BY THE NEGLIGENCE, OR ANY ACT OR OMISSION, OF OWNER OR ANY INDEMNIFIED PARTIES, IT BEING THE EXPRESSED INTENT OF OWNER AND CONTRACTOR THAT IN SUCH EVENT THE CONTRACTOR'S INDEMNITY, HOLD HARMLESS, AND DEFENSE OBLIGATION SHALL AND DOES INCLUDE CLAIMS ALLEGED OR FOUND TO HAVE BEEN CAUSED IN WHOLE OR IN PART BY THE NEGLIGENCE OR GROSS NEGLIGENCE OF OWNER OR ANY OTHER OWNER PERSON, OR CONDUCT BY OWNER OR ANY OTHER INDEMNIFIED PARTIES THAT WOULD GIVE RISE TO STRICT LIABILITY OF ANY KIND. THE INDEMNITY OBLIGATION UNDER THIS SUBPARAGRAPH (II) SHALL NOT BE LIMITED BY ANY LIMITATION ON THE AMOUNT OR TYPE OF DAMAGES, COMPENSATION, OR BENEFITS PAYABLE BY OR FOR CONTRACTOR UNDER WORKERS COMPENSATION ACTS, DISABILITY BENEFIT ACTS, OR OTHER EMPLOYEE BENEFIT ACTS.

I UNDERSTAND THAT THE INDEMNIFICATION PROVISIONS ARE REQUIRED OF ALL TOWN OF ADDISON CONTRACTS. I HAVE READ THE PROVISIONS AND AGREE TO THE TERMS OF THESE PROVISIONS.

Project/Bid #: Vivian Park Public Infrastructure 2016-09
Company Name: Flourfire Construction, Inc
Signature:  Date: 10/25/16

SECTION CA

CONTRACT AGREEMENT

CONTRACT AGREEMENT

STATE OF TEXAS

COUNTY OF DALLAS

THIS AGREEMENT is made and entered into this _____ day of _____, 2016, by and between the Town of Addison, of the County of Dallas and State of Texas, acting through its City Manager, thereunto duly authorized so to do, Party of the First Part, hereinafter termed the OWNER, and Flow-Line Construction, Inc. of the City of **Dallas**, County of **Dallas**, State of Texas, Party of the Second Part, hereinafter termed CONTRACTOR.

WITNESSETH: That for and in consideration of the payment and agreement hereinafter mentioned, to be made and performed by the OWNER, the said CONTRACTOR hereby agrees with the said OWNER to commence and complete construction of certain improvements as follows:

Town of Addison Public Improvements
to be known as

**VITRUVIAN PARK
PUBLIC INFRASTRUCTURE – BLOCK 200**

and all extra work in connection therewith, under the terms as stated in the General and Specific Conditions of the AGREEMENT; and at his 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 said construction, in accordance with the conditions and prices stated in the Proposal attached hereto and in accordance with the Advertisement for Bids, Instructions to Bidders, General Provisions, Special Provisions, Plans, and other drawings and printed or written explanatory matter thereof, and the Technical Specifications and Addenda thereto, as prepared by the OWNER, each of which has been identified by the endorsement of the CONTRACTOR and the OWNER thereon, together with the CONTRACTOR's written Proposal and the General Provisions, all of which are made a part hereof and collectively evidence and constitute the entire AGREEMENT.

The CONTRACTOR hereby agrees to commence work within ten (10) calendar days after the date of written notice to do so shall have been given to him, to complete the work within One Hundred Eighty Days (180) calendar days, after he commences work, subject to such extensions of time as are provided by the General Provisions.

The OWNER agrees to pay the CONTRACTOR \$3,823,868.00 in current funds for the performance of the Contract in accordance with the Proposal submitted thereof, subject to additions and deductions, as provided in the General Provisions, and to make payments of account thereof as provided therein.

IN WITNESS WHEREOF, the parties of these presents have executed this AGREEMENT in the year and day first above written.

TOWN OF ADDISON, TEXAS (OWNER)

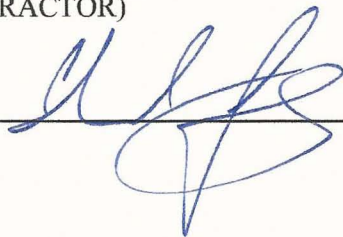
ATTEST:

By: _____
Wes Pierson, City Manager

By: _____
Laura Bell, City Secretary

(CONTRACTOR)

ATTEST:

By: _____


By: _____


The following to be executed if the CONTRACTOR is a corporation:

I, **Eduardo M. Hernandez** certify that I am the secretary of the corporation named as CONTRACTOR herein; that **Eduardo M. Hernandez**, who signed this Contract on behalf of the CONTRACTOR is the **President** (official title) of said corporation; that said Contract was duly signed for and in behalf of said corporation by authority of its governing body, and is within the scope of its corporate powers.

Signed: _____


Corporate Seal

CERTIFICATE OF INTERESTED PARTIES

FORM 1295

1 of 1

Complete Nos. 1 - 4 and 6 if there are interested parties.
 Complete Nos. 1, 2, 3, 5, and 6 if there are no interested parties.

OFFICE USE ONLY CERTIFICATION OF FILING

1 Name of business entity filing form, and the city, state and country of the business entity's place of business.

Flow-Line Construction, Inc.
 Dallas, TX United States

Certificate Number:
 2016-140029

Date Filed:
 11/28/2016

Date Acknowledged:

2 Name of governmental entity or state agency that is a party to the contract for which the form is being filed.

Town of Addison

3 Provide the identification number used by the governmental entity or state agency to track or identify the contract, and provide a description of the services, goods, or other property to be provided under the contract.

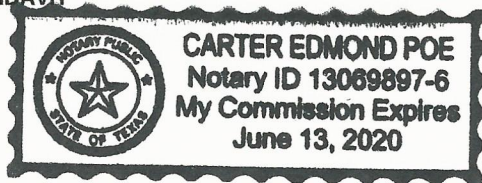
2016-09
 Vitruvian Park Public Infrastructure - Block 200

4	Name of Interested Party	City, State, Country (place of business)	Nature of interest (check applicable)	
			Controlling	Intermediary
	Hernandez, Eduardo	Dallas, TX United States	X	

5 Check only if there is NO Interested Party.

6 AFFIDAVIT

I swear, or affirm, under penalty of perjury, that the above disclosure is true and correct.



[Handwritten Signature]

 Signature of authorized agent of contracting business entity

AFFIX NOTARY STAMP / SEAL ABOVE

Sworn to and subscribed before me, by the said Eduardo Hernandez, this the 28 day of November 2016, to certify which, witness my hand and seal of office.

Carter Edmond Poe

 Signature of officer administering oath

Carter Edmond Poe

 Printed name of officer administering oath

Notary Public

 Title of officer administering oath

SECTION BB

BID BOND

BID BOND

Bidder shall submit a bid bond equal to five percent (5%) of the bid price. Failure to submit a bid bond when required may deem the bid non-responsive. Bid Bonds may be submitted electronically with the executed original provided immediately upon request.



BID BOND

KNOW ALL MEN BY THESE PRESENTS, that we Flow-Line Construction, Inc.
as principal, hereinafter called the "Principal," and **SURETEC INSURANCE COMPANY**, as surety, hereinafter called the
"Surety," are held and firmly bound unto Town of Addison
as obligee, hereinafter called the Obligee, in the sum of 5 % of the greatest amount bid by Principal for the
payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs,
executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the principal has submitted a bid for Bid Number 16-184, Infrastructure & Development Services #2016-09
Vitruvian Park Public Infrastructure - Block 200 Proj. No. Bid Number 16-184

NOW, THEREFORE, if the contract be timely awarded to the Principal and the Principal shall within such time as
specified in the bid, enter into a contract in writing or, in the event of the failure of the Principal to enter into such Contract,
if the Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the amount specified in
said bid and such larger amount for which the Obligee may in good faith contract with another party to perform the work
covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect.

PROVIDED, HOWEVER, neither Principal nor Surety shall be bound hereunder unless Obligee prior to execution of the
final contract shall furnish evidence of financing in a manner and form acceptable to Principal and Surety that financing
has been firmly committed to cover the entire cost of the project.

SIGNED, sealed and dated this 20th day of October, 2016.

Flow-Line Construction, Inc.
(Principal)

BY: [Signature]

TITLE: President

SURETEC INSURANCE COMPANY

BY: [Signature]

Kirk Dreyer , Attorney-in-Fact



SureTec Insurance Company

LIMITED POWER OF ATTORNEY

Know All Men by These Presents, That SURETEC INSURANCE COMPANY (the "Company"), a corporation duly organized and existing under the laws of the State of Texas, and having its principal office in Houston, Harris County, Texas, does by these presents make, constitute and appoint

Kirk Dreyer

its true and lawful Attorney-in-fact, with full power and authority hereby conferred in its name, place and stead, to execute, acknowledge and deliver any and all bonds, recognizances, undertakings or other instruments or contracts of suretyship to include waivers to the conditions of contracts and consents of surety for:

- Principal:** Flow-Line Construction, Inc.
- Obligee:** Town of Addison
- Amount:** \$Five Percent (5%) of the Greatest Amount Bid

and to bind the Company thereby as fully and to the same extent as if such bond were signed by the President, sealed with the corporate seal of the Company and duly attested by its Secretary, hereby ratifying and confirming all that the said Attorney-in-Fact may do in the premises. Said appointment is made under and by authority of the following resolutions of the Board of Directors of the SureTec Insurance Company:

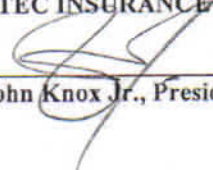
Be it Resolved, that the President, any Vice-President, any Assistant Vice-President, any Secretary or any Assistant Secretary shall be and is hereby vested with full power and authority to appoint any one or more suitable persons as Attorney(s)-in-Fact to represent and act for and on behalf of the Company subject to the following provisions:

Attorney-in-Fact may be given full power and authority for and in the name of and of behalf of the Company, to execute, acknowledge and deliver, any and all bonds, recognizances, contracts, agreements or indemnity and other conditional or obligatory undertakings and any and all notices and documents canceling or terminating the Company's liability thereunder, and any such instruments so executed by any such Attorney-in-Fact shall be binding upon the Company as if signed by the President and sealed and effected by the Corporate Secretary.

Be it Resolved, that the signature of any authorized officer and seal of the Company heretofore or hereafter affixed to any power of attorney or any certificate relating thereto by facsimile, and any power of attorney or certificate bearing facsimile signature or facsimile seal shall be valid and binding upon the Company with respect to any bond or undertaking to which it is attached. (Adopted at a meeting held on 20th of April, 1999.)

In Witness Whereof, SURETEC INSURANCE COMPANY has caused these presents to be signed by its President, and its corporate seal to be hereto affixed this 21st day of March, A.D. 2013.

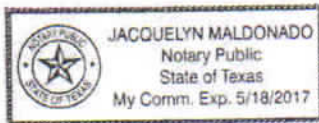
SURETEC INSURANCE COMPANY

By: 
John Knox Jr., President

State of Texas ss:
County of Harris



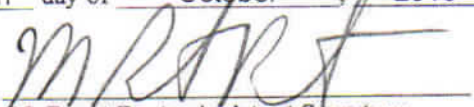
On this 21st day of March, A.D. 2013 before me personally came John Knox Jr., to me known, who, being by me duly sworn, did depose and say, that he resides in Houston, Texas, that he is President of SURETEC INSURANCE COMPANY, the company described in and which executed the above instrument; that he knows the seal of said Company; that the seal affixed to said instrument is such corporate seal; that it was so affixed by order of the Board of Directors of said Company; and that he signed his name thereto by like order.




Jacquelyn Maldonado, Notary Public
My commission expires May 18, 2017

I, M. Brent Beaty, Assistant Secretary of SURETEC INSURANCE COMPANY, do hereby certify that the above and foregoing is a true and correct copy of a Power of Attorney, executed by said Company, which is still in full force and effect; and furthermore, the resolutions of the Board of Directors, set out in the Power of Attorney are in full force and effect.

Given under my hand and the seal of said Company at Houston, Texas this 20th day of October, 2016, A.D.


M. Brent Beaty, Assistant Secretary

SureTec Insurance Company
THIS BOND RIDER CONTAINS IMPORTANT COVERAGE INFORMATION
Statutory Complaint Notice/Filing of Claims

To obtain information or make a complaint: You may call the Surety's toll free telephone number for information or to make a complaint or file a claim at: 1-866-732-0099. You may also write to the Surety at:

SureTec Insurance Company
9737 Great Hills Trail, Suite 320
Austin, Tx 78759

You may contact the Texas Department of Insurance to obtain information on companies, coverage, rights or complaints at 1-800-252-3439. You may write the Texas Department of Insurance at

PO Box 149104
Austin, TX 78714-9104
Fax#: 512-490-1007
Web: <http://www.tdi.state.tx.us>
Email: ConsumerProtection@tdi.texas.gov

PREMIUM OR CLAIM DISPUTES: Should you have a dispute concerning your premium or about a claim, you should contact the Surety first. If the dispute is not resolved, you may contact the Texas Department of Insurance.

SECTION PrB

PERFORMANCE BOND

**STATUTORY PERFORMANCE BOND PURSUANT TO CHAPTER 2253
OF THE TEXAS GOVERNMENT CODE
(PUBLIC WORKS)**

(Penalty of this Bond must be 100% of Contract Amount)

KNOW ALL MEN BY THESE PRESENTS, That _____
(hereinafter called the Principal), as Principal, and _____
(hereinafter called the Surety), as Surety are held and firmly bound unto the **Town of Addison** (hereinafter called the Obligee), in the amount of _____
_____ Dollars (\$ _____) for the
payment whereof the said Principal and Surety bind themselves and their heirs, administrators, executors, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Obligee, dated the _____ day of _____, 2016 to

**Town of Addison Public Improvements
to be known as
VITRUVIAN PARK
PUBLIC INFRASTRUCTURE – BLOCK 200**

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 the work in accordance with the plans, specifications and contract documents, 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 and all liabilities on this bond shall be determined in accordance with the provisions, conditions and limitations of said Chapter to the same extent as if it were copied at length herein.

IN WITNESS WHEREOF, the said Principal and Surety have signed this instrument this _____ day of _____, 2016.

(Principal)
By: _____

(Surety)
By: _____
(Attorney-in-Fact)

SECTION PyB

PAYMENT BOND

**STATUTORY PAYMENT BOND PURSUANT TO CHAPTER 2253
OF THE TEXAS GOVERNMENT CODE
(PUBLIC WORKS)**

(Penalty of this Bond must be 100% of Contract Amount)

KNOW ALL MEN BY THESE PRESENTS, That _____
(hereinafter called the Principal), as Principal, and _____
(hereinafter called the Surety), as Surety are held and firmly bound unto the **Town of Addison** (hereinafter
called the Oblige), in the amount of _____
_____ Dollars (\$ _____) for the
payment whereof the said Principal and Surety bind themselves and their heirs, administrators, executors,
successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the Oblige, dated the
_____ day of _____, 2016 to

**Town of Addison Public Improvements
to be known as
VITRUVIAN PARK
PUBLIC INFRASTRUCTURE – BLOCK 200**

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 and all liabilities on this bond shall be determined in accordance with the
provisions, conditions and limitations of said Chapter to the same extent as if it were copied at length
herein.

IN WITNESS WHEREOF, the said Principal and Surety have signed this instrument this _____
day of _____, 2016.

(Principal)
By: _____

(Surety)
By: _____
(Attorney-in-Fact)

SECTION MB

MAINTENANCE BOND

MAINTENANCE BOND

STATE OF TEXAS

COUNTY OF DALLAS

That _____ as principal and _____
_____, a corporation organized under the laws of _____
and _____ as sureties, said sureties being authorized to do business in the
State of Texas, do hereby expressly acknowledge themselves to be held and bound to pay unto the Town of
Addison, a municipal corporation, chartered by virtue of a Special Act of Legislature of the State of Texas, as
Addison, Dallas County, Texas, the sum of

(\$ _____) for the payment of which sum will and truly to be made unto said Town of Addison and its
successors, said principal and sureties do hereby bind themselves, their assigns and successors, jointly and severally.

This obligation is conditioned, however, that whereas said

has this day entered into a written contract with the said Town of Addison to build and construct the

Town of Addison Public Improvements

to be known as

VITRUVIAN PARK

PUBLIC INFRASTRUCTURE – BLOCK 200

which contract and the Plans and Specifications therein mentioned adopted by the Town of Addison, are hereby
expressly made a part hereof as though the same were written and embodied herein.

WHEREAS, under the Plans, Specifications and Contract it is provided that the Contractor will maintain and keep in good repair the work herein contracted to be done and performed for a period of two (2) years from the date of startup, and to do all necessary backfilling that may arise on account of sunken conditions in ditches, or otherwise, and to do and perform all necessary work and repair any defective condition growing out of or arising from the improper joining of the same, or on account of any breaking of the same caused by the said Contractor in laying or building the same, or on account of any defect arising in any of said part of said work laid or constructed by the said Contractor, or on account of improper excavation or backfilling; it being understood that the purpose of this section is to cover all defective conditions arising by reason of defective materials, work or labor performed by the said Contractor; and in case the said Contractor shall fail to do, it is agreed that the City may do said work and supply such materials, and charge the same against the said Contractor and sureties on this obligation, and the said Contractor and sureties hereon shall be subject to the liquidated damages mentioned in said contract for each day's failure on its part to comply with the terms of the said provisions of said contract;

NOW THEREFORE, if the said Contractor shall keep and perform its said agreement to maintain said work and keep the same in repair for the said maintenance period of two (2) years, as provided, then these presents shall be null and void and have no further effect; but if default shall be made by the said Contractor in the performance of its contract to so maintain and repair said work, then these presents shall have full force and effect, and said Town of Addison shall have and recover from the Contractor and its sureties damages in the premises, as provided, and it is further understood and agreed that this obligation shall be a continuing one against the principal and sureties hereon and that successive recoveries may be had hereon for successive branches until the full amount shall have been exhausted; and it is further understood that the obligation herein to maintain said work shall continue throughout said maintenance period, and the same shall not be changed, diminished, or in any manner affected from any cause during said time.

IN WITNESS WHEREOF, the said _____ has caused these presents to be executed by _____ and the said _____ has hereunto set his hand this the _____ day of _____, 2016 ____

SURETY

PRINCIPAL

By: _____

By: _____
Attorney in Fact

ATTEST

By: _____
Surety

Secretary

Agency and Address

NOTE: Date of Maintenance Bond must be same as date of City acceptance.

SECTION BP

CONTRACTOR'S AFFIDAVIT OF BILLS PAID

CONTRACTOR'S AFFIDAVIT OF BILLS PAID

STATE OF TEXAS

COUNTY OF DALLAS

Personally, before me the undersigned authority, on this day appeared _____ who, being
duly sworn, on oath, says that he is a legal representative of _____
(full name of Contractor as in contract)

and that the contract for the construction of the project, designated as

**Town of Addison Public Improvements
to be known as**

VITRUVIAN PARK

PUBLIC INFRASTRUCTURE – BLOCK 200

Infrastructure & Development Services #2016-09

has been satisfactorily completed and that all bills for materials, apparatus, fixtures, machinery and labor used in connection with the construction of this project have, to the best of my knowledge and belief, been fully paid.

Signature

Title

Sworn to and subscribed before me this _____ day of _____, 2016.

Notary Public in and for

County, Texas

Instructions:

If the contractor is an individual, he shall sign the affidavit. If the contractor is a partnership, any partner may sign the affidavit. If the contractor is a corporation, a person authorized by the by-laws or by the Board of Directors shall sign the affidavit. If the Contractor is a joint-venture of individuals, any of the individuals may sign the affidavit. If the Contractor is a joint-venture of partnerships, or of individuals and partnerships, the affidavit may be signed by the individual or any partner of any partnership. If the contractor is a joint-venture in which a corporation is a party, separate affidavits must be executed in the name of the joint-venture: one by each corporation and one by each individual or partnership. Signatures for corporations should be by a duly authorized officer. If signature is by another, a showing of authority to sign must accompany the affidavit.

SECTION GP

GENERAL PROVISIONS

GENERAL PROVISIONS

The General Provisions of the Contract shall be as stated in the Standard Specifications for Public Works Construction, North Central Texas Council of Governments 2004 Version, under Division 100, "General Provisions," as amended or supplemented and except as modified by the Special Provisions.

SECTION SP
SPECIAL PROVISIONS

SPECIAL PROVISIONS
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SPECIAL PROVISIONS

1. **SCOPE OF WORK:** The work to be performed under the provisions of these Contract Documents shall consist of furnishing all materials, labor, equipment, supplies and appurtenances; providing all construction, plant, equipment and tools; performing all necessary labor and supervision; and the construction complete, including all work appurtenant thereto, the proposed improvements for **Vitruvian Park Public Infrastructure – Block 200.**

2. **GENERAL:** This work shall conform to the requirements of the specifications and the details as shown on the Drawings. These Contract Documents are intended to be complementary. Requirements of any of the Contract Documents are as binding as if called for by all. In the event of conflict between the Drawings and the Specifications, the Contractor will be deemed to have assumed the more expensive way of doing the work unless, before submitting a bid, the Contractor shall have asked for and obtained (by addendum) a written decision as to which method or material is intended.

In cases of discrepancies, calculated dimensions shall govern over scaled dimensions; special provisions and special specifications shall govern over both general and standard specifications; and quantities shown on the plans shall govern over those shown in the proposal.

3. **EXAMINATION OF SITE:** The Contractor acknowledges that he has investigated and satisfied himself as to the conditions affecting the work, including but not restricted to those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, electric power, roads and uncertainties of weather, or similar physical conditions at the site, conditions of the ground, the character of equipment and facilities needed preliminary to and during prosecution of the work. The Contractor acknowledges that he has inspected the site of the work and is familiar with the soil conditions to be encountered. Any failure by the Contractor to acquaint himself with the available information will not relieve him from responsibility for estimating properly the difficulty or cost of successfully performing the work. The Town of Addison assumes no responsibility for any conclusions or interpretations made by the Contractor on the basis of the information made available by the Town and the Engineer.

4. **SPECIFICATIONS:** Construction improvements shall be governed by the following published specifications and details (except as modified by these Special Provisions):

Standard Specifications for Public Works Construction, North Central Texas - North Central Texas Council of Governments (latest edition);

Town of Addison Standard Specifications and Construction Details;

Standard Specifications and Details for Manhole and Duct Structure Facilities as established by Oncor Electric Delivery and AT&T.

The Contractor shall keep copies of applicable specifications on the project site at all times. Where reference is made to specifications compiled by other agencies, organizations or departments, such specifications referred to are hereby made a part of the project specifications.

5. **SUBSURFACE INVESTIGATION:** Subsurface exploration to ascertain the nature of soils, including the amount of rock, if any, is the responsibility of any and all prospective bidders. It shall be the responsibility of the bidders to make such subsurface investigations as he deems necessary to determine the nature of the material to be encountered. Some preliminary subsurface exploration has been performed by the Town of Addison and the Engineer, and is provided to the contractor in these documents. This information is provided only as preliminary and all bids shall be based on information obtained by the Contractor. The Town of Addison and the Engineer disclaim any responsibility for the accuracy, true location and extent of the soils information that has been prepared by others. They further disclaim responsibility for interpretation of that data by bidders, as in projecting soil bearing values, rock profiles, soils stability and the presence, level and extent of underground water.
6. **COMPLIANCE WITH LAWS:** The Contractor shall familiarize himself with the nature and extent of the specifications, site conditions, traffic and safety requirements, and shall fully comply with all local, state and federal laws, including all codes, ordinances, rules and regulations applicable to this contract and the work to be done hereunder, which exist or which may be enacted later by governmental bodies having jurisdiction or authority for such enactment. The Contractor shall comply with all federal, state and local laws, rules and regulations of every kind and nature applicable to the performance of its Work hereunder, and **SHALL HOLD THE TOWN OF ADDISON, UDR INC., VPDEV 1 LLC, VP WEST 1 LLC (COLLECTIVELY, THE “UDR PARTIES”) AND THE ENGINEER HARMLESS THEREFROM.**
7. **PERMITS, LICENSES AND REGULATIONS:** Permits and licenses for the prosecution of the Work shall be secured and paid for by the Contractor. Wherever the work under this contract requires the obtaining of permits from the Town of Addison or other public authorities, duplicate copies of such permits shall be furnished to the Engineer by the Contractor hereunder before the work covered thereby is started. **NO WORK WILL BE ALLOWED TO PROCEED BEFORE SUCH PERMITS ARE OBTAINED.**
8. **RIGHTS-OF-WAY AND EASEMENTS:** Rights-of-way and permanent easements, dedicated to the Town of Addison, have been secured for this project and made a part of thereto. The Contractor shall obtain a right-of-way permit from the Town of Addison prior to beginning work. When working within the public rights-of-way and easements, the Contractor shall at all times observe and comply with all Federal and State Laws, and Town of Addison ordinances and regulations which in any way affect the conduct of the work or his operations, and shall observe and comply with all orders, laws, ordinances and regulations which exist or which may be enacted later by bodies having jurisdiction or authority for such enactment. No plea of misunderstanding or ignorance thereof will be considered. **THE CONTRACTOR AND HIS SURETIES SHALL INDEMNIFY AND SAVE HARMLESS THE TOWN OF ADDISON, THE UDR PARTIES, THE ENGINEER AND ALL OF**

THEIR OFFICERS, AGENTS, AND EMPLOYEES AGAINST ANY AND ALL CLAIMS OR LIABILITY ARISING FROM OR BASED ON THE VIOLATION OF ANY SUCH LAW, ORDINANCE, REGULATION, OR ORDER, WHETHER IT BE BY HIMSELF OR HIS EMPLOYEES.

It shall be the responsibility of the Contractor, prior to the initiation of construction on easements through private property, to inform the Town of his intent to begin construction. Before beginning construction in areas of public dedication, the Contractor shall inform the agency having jurisdiction in the area forty-eight (48) hours prior to initiation of the Work. All easements shall be cleaned up after use and restored to their original conditions or better.

9. **RESTRICTED WORK HOURS:** Per the Town of Addison Building Regulations, "It shall be unlawful for a person, firm or corporation to excavate, erect, build, construct, alter, repair or demolish any building or structure which has been issued or which is required to be issued a building permit by the Town of Addison between the hours of 7:00 p.m. and 7:00 a.m. Monday through Friday, and between the hours of 7:00 p.m. and 8:00 a.m. on Saturday and Sunday, if such activity is performed within a residential, apartment, or townhouse zoned area, or within three hundred (300) feet of an occupied residence, except in cases of urgent necessity or in the interest of public safety and convenience, and then only by permit of the City Manager."
10. **COMPLIANCE WITH IMMIGRATION LAWS:** Contractor shall take all steps necessary to ensure that all of the Contractor's employees are authorized to work in the United States as required by the Immigration Reform and Control Act of 1986.
11. **NON-DISCRIMINATION POLICY:** It is the policy of the Town of Addison to afford all people an equal opportunity to bid on any contract being let by the Town. The Town of Addison has a policy that prohibits discrimination against any person because of race, color, sex, or national origin, in the award or performance of any contract. The Town of Addison will require its employees, agents, and contractors to adhere to this policy.
12. **ANTITRUST LAWS:** The Contractor hereby assigns to the Town of Addison any all claims for overcharges associated with this contract which arise under the antitrust laws of the United States 15 U.S.C.A. Sec. 1, et seq. (1973).
13. **ABANDONMENT:** The Town of Addison reserves the right to abandon, without obligation to the Contractor, any part of the project, or the entire project, at any time before the Contractor begins any construction work authorized by the Town of Addison. In case of total abandonment of the project, the contract becomes void. The Town of Addison may abandon portions of the project at any time during the project duration. In case of such partial abandonment, the Contractor shall not be due any payment for lost or unrealized profits on the abandoned portions of the project.
14. **DISCREPANCIES:** If the Contractor, in the course of the Work, finds any discrepancy between the Contract Documents and the physical conditions of the locality, or any errors or omissions in drawings or in the layout as given by survey points and instructions, or if it appears that any Plan, Specification or other Contract Document is or may not be in compliance with any building code or other requirement of any governmental body, he

shall immediately inform the Town of Addison and the Engineer in writing, and the Town of Addison and the Engineer shall promptly verify the same. Any Work done after such discovery, until authorized, will be done at the Contractor's risk.

15. **PREVAILING WAGE RATES:** Wage rates paid on this project shall not be less than specified in the schedule of general prevailing rates of per diem wages as attached hereto.
16. **ADDENDA:** Bidders desiring further information, or interpretation of the Plans and Specifications, must make written request for such information to the Engineer (not later than three (3) working days prior to the date set for the Bid opening). Answers to all such requests will be released on www.bidsync.com in addendum form and all addenda will be bound with and made a part of the Contract Documents. No other explanation or interpretation will be considered official or binding. Should a Bidder find discrepancies in, or omissions from, the Plans, Specifications or Contract Documents, or should he be in doubt as to their meaning, he shall at once notify the Engineer in writing in order that a written addendum may be sent to all Bidders.
17. **PAY ITEMS:** Pay items provided are intended to be all-inclusive of the work required on this project. Work required by the plans or specifications but not provided with a specific pay item shall be considered incidental to other items of work. Final payment to the construction contractor shall not be made until all Work has been finally completed and verified in accordance with the construction contract, plans and specifications and have been finally accepted by the Town of Addison.
18. **INCREASE OR DECREASE IN QUANTITIES:** The quantities shown in the proposal are approximate. Final payment will be based on quantities determined by measurement methods described for each work item.

When the quantity of work to be done or materials to be furnished under any major pay item or contract is more than 125% of the quantity stated in the contract, whether stated by Town of Addison or by Contractor, then either party to the contract, upon demand, shall be entitled to negotiate for revised consideration on the portion of work above 125% of the quantity stated in the contract.

When the quantity of the work to be done or materials to be furnished under any major pay item of the contract is less than 75% of the quantity stated in the contract, whether stated by Town of Addison or by Contractor, then either party to the contract, upon demand, shall be entitled to negotiate for revised consideration on the portion of work below 75% of the quantity stated in the contract. This paragraph shall not apply in the event Town of Addison deletes a pay item in its entirety from this contract.

19. **SUBSIDIARY WORK:** Any and all work specifically governed by documentary requirements for the project, such as conditions imposed by the Plans or these Special Provisions, in which no specific item for bid has been provided for in the Proposal, shall be considered as a subsidiary item of work, the cost of which shall be included in the various bid items in the Proposal. Costs of permits, inspection fees, traffic control, construction staking, surface restoration and cleanup are general items of work which fall in the category of subsidiary work.

20. **QUALIFICATION OF BIDS:** The Town of Addison reserves the right to reject any and all Bids, to waive any and all informalities not involving price, time or changes in the Work, and the right to disregard all nonconforming, non-responsive, unbalanced, or conditional Bids. The Town reserves the right to reject the Bid of any Bidder if the Town believes that it would not be in the best interest of the Project to make an award to that Bidder, whether because the Bid is not responsive or the Bidder is unqualified or of doubtful financial ability or fails to meet any other pertinent standard or criteria established by the Town. Discrepancies in the multiplication of units of Work and unit prices will be resolved in favor of the unit prices. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolve in favor of the correct sum.
21. **AWARD AND EXECUTION OF CONTRACT:** The Town of Addison reserves the right to withhold final action on the Proposal for a reasonable time, not to exceed forty-five (45) days after the date of opening Proposals, and in no event will an award be made until after investigations have been made as to the responsibility of the proposed awardee. The award of the contract, if an award is made, will be to the lowest and best responsible bidder. The award of the contract shall not become effective until the Town of Addison has notified the Contractor in writing of such award.

Within ten (10) days after the Town of Addison has by appropriate resolution, or otherwise, awarded the contract, the Contractor shall execute and file with the Town of Addison the Contract and such bonds as may be required in the Contract Documents.

22. **EXPLANATION OF CONTRACT TIME:** The term "Original Contract Time" as used in this Provision will mean the number of calendar days established in this Contract (**180 calendar days**) for completion of the work of the Contract from the date the Contract was executed. The term "calendar day" as used in this Article will mean every day shown on the calendar. Calendar days will be consecutively counted from commencement of Contract Time regardless of weather, weekends, holidays, suspensions of Contractor's operations, delays or other events as described herein. The Original Contract Time will not be adjusted for any reason, cause or circumstance whatsoever, regardless of fault, save and except in the instance of a catastrophic event (i.e., war, invasion, riot, declared state of emergency, national strike, or other situations as declared by the Town of Addison). The parties anticipate that delays may be caused by or arise from any number of events during the course of the Contract, including, but not limited to, work performed, disruptions, permitting issues, actions of suppliers, subcontractors or other contractors, actions by third parties, weather, weekends, holidays, or other such events, forces or factors sometimes experienced in roadway construction work. Such delays or events and their potential impacts on performance by the Contractor are specifically contemplated and acknowledged by the parties in entering into this Contract, and shall not extend the Original Contract Time. Further, any and all costs or impacts whatsoever incurred by the Contractor in accelerating the Contractor's work to overcome or absorb such delays or events in an effort to complete the Contract prior to expiration of the Original Contract Time, regardless of whether the Contractor successfully does so or not, shall be the sole responsibility of the Contractor in every instance. In the event the project is altered by work deleted, change orders, supplemental

agreements, utility conflicts, design changes or defects, extra work, right of way issues, or other situations which are not the fault of or a direct result of contractor negligence which may impact the critical path of the project construction schedule, the Town may choose to negotiate the extension or reduction of the Original Contract Time with the Contractor.

In the event of a catastrophic event (i.e., war, invasion, riot, declared state of emergency, national strike, or other situations as declared by the Town of Addison) directly and substantially affecting the Contractor's operations on the Contract, the Contractor and the Town shall agree as to the number of calendar days to extend the Original Contract Time. In the event the Contractor and Town are unable to agree to the number of calendar days to extend the Original Contract Time, the Town shall unilaterally determine the number of calendar days to extend the Original Contract Time reasonably necessary and due solely to such catastrophic event and the Contractor shall have no right whatsoever to contest such determination, save and except that the Contractor establishes that the number of calendar days determined by the Town were arbitrary or without any reasonable basis. The Contractor shall have no rights under the Contract to make any claim arising out of this incentive payment provision except as is expressly set forth in this Provision.

Should the Contractor fail to complete the Contract on or before expiration of the Allowable Contract Time the Town shall deduct from the moneys due the Contractor the sum of **\$500 per day** for each calendar day completion exceeds the Allowable Contract Time. The term "Allowable Contract Time" as used in this Article shall mean the Original Contract Time plus adjustments made pursuant to the provisions of this Article. This deduction shall be the disincentive for the Contractor's failing to timely complete the Contract. **This shall be strictly enforced.**

23. **COPIES OF PLANS FURNISHED:** One (1) set of 11" x 17" plans and one (1) electronic version of the plans shall be furnished to the Contractor, at no charge, for construction purposes. Additional copies may be obtained at cost of \$150 per set upon request.
24. **PRE-CONSTRUCTION CONFERENCE:** The successful Contractor, Engineer, and Town of Addison shall meet for a preconstruction conference before any of the work begins on this project. At this time, details of sequencing of the work, contact individuals for each party, testing requirements, submittals, and pay requests will be covered. Prior to the meeting, the Contractor shall prepare schedules showing the sequencing and progress of their work and its effect on others. A final composite schedule will be prepared during this conference to allow an orderly sequence of project construction.
25. **MOBILIZATION:** The work specified in this item consists of the preparatory work and operations in mobilizing for beginning work on the project, including, but not limited to, those operations necessary for the movement of personnel, equipment, supplies and incidentals to the project site, and for the establishment of temporary offices, utilities, and other facilities, if necessary, for the construction of proposed improvements. Maximum allowed will be 5% of the total bid.

26. **GENERAL SEQUENCE OF CONSTRUCTION:** Prior to the start of work, the Contractor shall develop a detailed construction and sequence of construction schedule using the critical path method, to be submitted to the Town of Addison for approval, that shall cause minimum interference with traffic along, across and adjacent to the project during construction. If the schedule or sequence becomes unworkable or unsatisfactory as work proceeds, adjustments shall be made subject to Town of Addison approval. During all phases of construction access to all existing residences and businesses must be maintained at all times unless otherwise authorized in writing by the Town of Addison. Erosion control devices must be properly installed and maintained during all stages of construction.
27. **PROJECT REPRESENTATIVE:** The Town of Addison, the Engineer, the Contractor(s), and any applicable public utilities shall designate a single individual within their organization to act as liaison for the project. This individual shall be aware of the day to day activities on the project, have authority to make decisions binding on the party, and serve as single point for coordination of activities with the other team members.
28. **COORDINATION WITH OTHERS:** In the event that other Contractors are doing work in the same area simultaneously with this project, the Contractor shall coordinate his proposed construction with that of the other Contractors. The Town of Addison and/or the Engineer shall mediate any disputes, and the Contractors shall comply with their decisions.
29. **INSURANCE:** Each insurance policy that the Contractor must furnish in accordance with these contract documents shall name the Town of Addison, the UDR Parties and the Engineer as additional insured. Contractor shall include in their bid package, a copy of their certificate of insurance showing compliance to the limits established by the Town of Addison.

1.0 The Contractor shall agree to furnish and maintain continuously during the period of this agreement, any renewals or extension, insurance coverage meeting all of the following requirements:

1.1 Commercial General Liability Insurance at minimum combined single limits of \$1,000,000 per occurrence and \$2,000,000 general aggregate for Bodily Injury and Property Damage, which coverage shall include Products/Completed Operations, and XCU Hazards. Coverage for product/completed operations must be maintained for at least two (2) years after the construction work has been completed. Coverage must be amended to provide for an each-project aggregate limit of insurance. Contractual Liability must be included.

1.2 Workers Compensation Insurance at statutory limits, including employer's liability coverage at minimum limits of \$1,000,000 each occurrence-each accident, \$1,000,000 by disease-each occurrence and \$1,000,000 by disease aggregate (see attachment on Workers Compensation Commission rules).

1.3 Commercial Automobile Liability Insurance at minimum combined single limits of \$1,000,000 per occurrence for bodily injury and property damage, including owned, non-owned, and hired car coverage.

1.4 Umbrella Liability at minimum limits of \$1,000,000 each-occurrence \$4,000,000 aggregate with respect to primary commercial general liability, automobile liability and employer's liability policies.

1.5 Any Subcontractor(s) hired by the Contractor shall maintain insurance coverage equal to that required by the Contractor. It is the responsibility of the Contractor to assure compliance with this provision. The Town accepts no responsibility arising from the conduct, or lack of conduct, of the Subcontractor.

1.6 A comprehensive general liability insurance form may be used in lieu of a commercial general liability form. In this event, coverage must be written on an occurrence basis, at limits of \$1,000,000 each-occurrence, combined single limit and coverage must include a broad form comprehensive general liability endorsement, products/completed operations, XCU hazards and contractual liability.

2.0 With reference to the foregoing insurance requirements, Contractor shall specifically endorse applicable insurance policies as follows:

2.1 The Town and the UDR Parties shall be named as an additional insured with respect to general liability and automobile liability.

2.2 All liability policies shall contain no cross liability exclusions or insured versus insured restrictions.

2.3 A waiver of subrogation in favor of the Town of Addison and the UDR Parties shall be contained in the workers compensation and all liability policies.

2.4 All insurance policies shall be endorsed to require the insured to immediately notify the Town of Addison of any material changes in the insurance coverage.

2.5 All insurance policies shall be endorsed to the effect that the Town will receive at least thirty (30) days notice prior to cancellation or non-renewal of the insurance.

2.6 All certificates shall be mailed to Town of Addison, Purchasing Dept., P.O. Box 9010, Addison, Texas 75001.

2.7 All insurance policies, which name the Town and the UDR Parties as an additional insured, must be endorsed to read as primary coverage regardless of the application of other insurance.

2.8 Required limits may be satisfied by any combination of primary and umbrella liability insurances.

- 2.9 Contractor may maintain reasonable and customary deductibles, subject to approval by the Town.
- 3.0 All insurance shall be purchased from an insurance company who meets the following requirements:
- 3.1 Must be issued by a carrier, which is rated "A-" or better by A.M. Best's Key Rating Guide.
- 3.2 Licensed and admitted to do business in the State of Texas and is a subscriber to the Texas Guaranty Fund.
- 4.0 All insurance must be written on forms filed with and approved by the Texas State Board of Insurance. Certificates of insurance shall be prepared and executed by the insurance company or its authorized agent and shall contain provisions representing and warranting the following:
- 4.1 Set forth all endorsements and insurance coverages according to requirements and instruction contained herein.
- 4.2 Shall specifically set forth the notice-of-cancellation or termination provisions to the Town.
- 5.0 Upon request, Contractor shall furnish the Town of Addison with certified copies of all insurance policies.

30. WORKERS' COMPENSATION INSURANCE COVERAGE:

A. Definitions.

Certificate of Coverage ("certificate") - A copy of a certificate of insurance, a certificate of authority to self insure issued by the Texas Workers' Compensation Commission (the "TWCC"), or a coverage agreement (TWCC-81, TWCC-82, TWCC-83 or TWCC-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 Section 406.096 of the Texas Labor Code) - 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, Town-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 property reporting of classification codes and payroll amounts and filing of any coverage agreement, which meets the statutory requirements of Texas Labor Code, 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 Town of Addison 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 Town of Addison, showing that the coverage has been extended.

E. The Contractor shall obtain from each person providing services on the project, and provide to the Town of Addison:

(1) a certificate of coverage, prior to that person beginning work on the project, so that the Town of Addison 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 on file for the duration of the project and for one year thereafter.

G. The Contractor shall notify the Town of Addison 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 TWCC, informing all persons providing services on the project that they are required to be covered, and stating how a person may verify current coverage and report failure to provide 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 Codes 401.011 (44) for all 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 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 the coverage period, 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 Town of Addison 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 other person with whom it contracts to perform as required by paragraphs (1) - (7) with the certificate 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 Town of Addison that all employees of the Contractor who will provide services on the project will be covered by worker's 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 TWCC'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 Town of Addison to declare the contract void if the Contractor does not remedy the breach within ten days after receipt of notice of breach from the Town.

The following is the form of notice of workers' compensation coverage prescribed by the TWCC. Pursuant to Section 110.110 (d) (7), this notice must be printed with a title in at least 30-point bold type, and text in at least 19-point nominal type, and shall be in both English and Spanish and any other language common to the worker population.

REQUIRED WORKERS' COMPENSATION COVERAGE

"The law requires that each person working on this site or providing services related to this construction project must be covered by workers' compensation insurance. This includes persons providing, hauling or delivering equipment or materials, or providing labor or transportation or other service related to the project, regardless of the identity of their employer or status as an employee.

"Call the Texas Workers' Compensation Commission (TWCC) at (512) 440-3789 to receive further information on the legal requirements for coverage, to verify whether your employer has provided the required coverage, or to report an employer's failure to provide coverage."

31. **CLEAN AIR ACT AND CLEAN WATER ACT:** "Contractor is responsible for compliance with all applicable standards, orders, or requirements issued under Section 306 of the Clean Air Act, Section 505 of the Clean Water Act, Executive Order 11738, and Environmental Protection Agency regulations."
32. **RESOLUTION OF DISPUTES:** The parties hereby covenant and agree that in the event of any controversy, dispute, or claim, of whatever nature arising out of, in connection with or in relation to the interpretation, performance or breach of this agreement, including but not limited to any claims based on contract, tort or statute, before filing a lawsuit, the parties agree to submit the matter to Alternative Dispute Resolution pursuant to the laws of the State of Texas. The parties shall select a third party arbitrator or mediator from the current list of neutrals on file with the Alternative Dispute Resolution Administrator of the Dallas County District Courts. All forms of Alternative Dispute Resolution may be used except binding arbitration. The proceedings shall be conducted in accordance with the laws of the State of Texas.
33. **SHOP DRAWINGS:** The Contractor shall provide, review, approve and submit all shop drawings, product data and samples required by the Town of Addison, the Engineer and the Contract Documents in accordance with Item 1.28 of the Standard Specifications for Public Works Construction, North Central Texas Council of Governments. The Contractor shall furnish a minimum of four and a maximum of six copies of shop drawings for review by the Engineer, who will review, approve and forward to the Town of Addison for acceptance. Approved submittals will be returned as follows:
 - Two (2) – Town of Addison
 - One (1) – Contractor
 - One (1) – Icon Consulting Engineers, Inc.

Maximum size of submittals shall be 11 x 17 inch. No fax copies are acceptable. Shop drawings shall include all items to be installed in the project, including:

- Concrete Mix Designs
- Storm Sewer Pipe
- Fire Hydrants
- Trench Safety Plan
- Steel Casing Pipe
- Conduit
- Traffic Control Plan
- Sanitary Sewer Pipe
- Sanitary Sewer Manholes
- Fittings
- Flex Base
- Embedment Materials
- Water Main Pipe
- Valves & Boxes
- Water Vaults
- Gradation
- Asphalt
- Backfill Materials

34. **PROJECT VIDEO:** Prior to the start of construction, Contractor shall video the construction area and property adjacent to construction in the presence of the City Inspector. The format shall be DVD. The video shall be narrated. The Contractor shall furnish the Town of Addison a copy of the video in DVD format prior to commencement of project. This shall be subsidiary to project.
35. **TESTING REQUIREMENTS:** The Town of Addison shall designate and pay an independent testing laboratory to furnish testing for this project. Random testing will be provided by the independent lab as necessary for compliance with the specifications. The Contractor shall coordinate construction with the testing lab and the Town of Addison, and shall provide assistance to the testing labs by providing excavation, access, trench safety, materials for testing and any other work required to insure all testing requirements are met. Work performed to accommodate testing will be a subsidiary item and no extra payment will be authorized. All costs for the field quality control testing shall be paid for by the Town of Addison, except for any and all re-testing, which shall be paid by the Contractor and such cost shall be deducted from monthly pay requests. The Contractor shall be responsible for providing any test required by the specifications. All samples and tests shall be performed in accordance with the Standard Specifications for Public Works Construction, North Central Texas Council of Governments (Latest Edition) as amended or supplemented.
36. **INSPECTION:** The Town of Addison and the Engineer reserve the right to inspect, test, measure or verify the construction work for this project as they deem necessary to ascertain that the Work is being accomplished in accordance with the standards and requirements set forth in the Contract Documents. Notwithstanding such reviews, the Contractor will be held responsible for the finished Work, and any acceptance of the Work by the Town or governmental agencies will not relieve the Contractor from responsibility for the Work. The Town reserves the right to place full-time construction inspectors at the site of the Work. Costs for inspection services will be paid by the Town of Addison. The Contractor shall provide assistance to the Town of Addison and the Engineer by providing excavation, trench safety, or other work necessary to facilitate inspection activities, and shall give sufficient notice well in advance of pending construction activities for scheduling of inspection services.

If the Specifications, the Town's instructions, laws, ordinances, or any public authority require any Work to be specially tested, the Contractor shall give the Town timely notice of its readiness for testing, and if the testing is by an authority other than the Town, of the date fixed for such testing. Tests by the Town shall be made promptly, and where practicable at the source of supply.

37. **ACCESS ROUTES, STAGING AREAS AND STORAGE AREAS:** All haul roads and access routes and the location of job site trailers, staging areas, and storage areas shall be subject to the approval of the Town and the Engineer. The Contractor shall be responsible for maintaining and repairing all roads and other facilities used during construction. Upon completion of the project all existing roads and other disturbed areas shall be left in a condition equal to that at the time the Contractor commences work on this project.
38. **PROPERTY ACCESS:** Access to adjacent properties shall be maintained at all times unless otherwise directed by the Engineer and/or Town of Addison. Contractor shall block no more than one half of a driveway at any time. Contractor shall also maintain sufficient sidewalk access throughout the project limits to the existing apartment buildings during construction operations.
39. **PLANT, PROCEDURE, METHODS AND EQUIPMENT:** The Contractor shall determine the methods to be employed, the procedures to be followed, and equipment to be used on the work under this contract, subject to the requirements of these specifications and approval of the Engineer and Town of Addison. Only adequate and safe procedures, methods and equipment shall be used. The Contractor shall so arrange his work and provide such plant and equipment as is necessary in order to meet the progress requirements of the approved time schedule and to complete the work within the period of time as specified in the Construction Agreement. Only such materials and equipment as are necessary for the construction of the work under this contract shall be placed, stored or allowed to occupy any space at the site of the work.

It is expressly agreed that the acceptance or approval of any order of procedure, methods or equipment submitted or employed by the Contractor shall not in any manner relieve the Contractor of responsibility for the safety, maintenance and repairs of any work, or for the construction maintenance and safety of the work hereunder, or from any liability whatsoever on account of any procedure or method employed by the Contractor. Where the work under this contract requires permits from the Town of Addison, the State of Texas, or other public authorities, duplicate copies of such permits shall be furnished to the Engineer by the Contractor before the work covered thereby is started. **NO WORK WILL BE ALLOWED TO PROCEED BEFORE REQUIRED PERMITS ARE OBTAINED AND DISTRIBUTED.**

40. **PARKING OF CONSTRUCTION EQUIPMENT:** At night and during all other periods of time when equipment is not being actively used on the construction work, the Contractor shall park the equipment at locations which are approved by the Town of Addison or the Engineer. The Contractor shall provide adequate barricades, markers and lights to protect the Town of Addison, the Engineer, the public and other work. All barricades, lights, and markers must meet the requirements of the Town of Addison, State and Federal regulations.

41. **ZONING REQUIREMENTS:** During the construction of this project, the Contractor shall comply with the present zoning requirements of the Town of Addison in the use of vacant property for storage purposes.
42. **CONSTRUCTION IN PUBLIC ROADS AND PRIVATE DRIVES:** No public road shall be entirely closed overnight. It shall be the responsibility of the Contractor to build and maintain all weather bypasses and detours, if necessary, and to properly light, barricade and mark all bypasses and detours that might be required on and across the roads involved in the work included in this contract. No interference with traffic flow on city streets shall be permitted during the hours of 6:30 a.m. to 9:30 a.m. and 3:30 p.m. to 7:30 p.m., Mondays through Fridays.

The Contractor shall make every effort to complete construction and allow immediate access to adjacent property at driveway entrances located along the roadways. Towns or tenants of improvements where access and/or entrance drives are located shall be notified at least twenty-four (24) hours prior to the time the construction will be started at their driveways or entrances and informed as to the length of time driveways will be closed. Contractor shall at all times maintain at least one point of access into all properties, unless obtaining written permission from property Town to do otherwise with such written permission being provided to the Town's inspector.

The Contractor shall be responsible for all road and entrance reconstruction and repairs and maintenance of same for a period of two years from the date of such reconstruction. In the event the repairs and maintenance are not made immediately to the satisfaction of the Town, and it becomes necessary for the Town to make such repairs, the Contractor shall reimburse the Town for the cost of such repairs.

The Contractor shall, at all times, keep a sufficient width of the roadway clear of dirt and other material to allow the free flow of traffic. The Contractor shall assume any and all responsibility for damage, personal or otherwise, that may be caused by the construction along roads and private drives.

43. **HAULING ON TOWN OF ADDISON STREETS:** The Contractor shall receive approval of his haul routes and type of equipment to be used prior to beginning construction. The Contractor shall be responsible for maintaining the cleanliness of existing paved roadways and shall provide equipment and manpower for that purpose.
44. **EXISTING POWER POLES & GUY WIRES:** The Contractor shall have the responsibility of coordinating with the proper authorities for the bracing, replacing or relocating of all utility poles and guy wires which interfere with the construction of this project prior to beginning his construction operations. The Contractor will also be responsible for all damage to poles, guy wires, etc. that are damaged or destroyed by Contractor's operations.
45. **SAFETY RESTRICTIONS - WORK NEAR HIGH VOLTAGE LINES:** The following procedures shall be followed for work near high voltage lines on this contract:

- a. A warning sign not less than five (5) inches by seven (7) inches, painted yellow with black letters that are legible at twelve (12) feet shall be placed inside and outside vehicles such as cranes, derricks, power shovels, drilling rigs, pile driver, hoisting equipment or similar apparatus. The warning sign shall read as follows: “Warning - Unlawful to Operate This Equipment Within Six Feet of High Voltage Lines.”
- b. Equipment that may be operated within ten (10) feet of high voltage lines shall have an insulating cage guard protecting the boom or arm, except backhoes or dippers, and insulator links on lift hook connections.
- c. When necessary to work within six (6) feet of high voltage electric lines, notify the power company who will erect temporary mechanical barriers, de-energize the line, or raise or lower the line. All such work done by the power company shall be at the expense of the Contractor. The Contractor shall maintain an accurate log of all such calls to the power company.
- d. The Contractor is required to make arrangements with the power company for the temporary relocation or raising of high voltage lines at the Contractor’s sole expense.
- e. No person shall work within six (6) feet of high voltage lines without protection measures having been taken as outlined in Paragraph c.

46. **PROTECTION OF EXISTING UTILITIES AND STRUCTURES:** The location and dimensions shown on the plans relative to existing utilities and subsurface structures are based on the best records and/or field information available and are not guaranteed by the Town of Addison or the Engineer to be accurate as to location and depth. It shall be the Contractor’s responsibility to verify locations of adjacent and conflicting utilities sufficiently in advance of his activities in order that he may negotiate such restrictive locations with the Town of Addison of the conflicting utility and/or make local adjustments to provide adequate clearances. The Contractor shall take all necessary precautions in order to protect all utilities and services encountered, whether or not they are indicated on the plans. All damage to utilities resulting from Contractor’s operations shall be restored at his expense. The Town of Addison and the Engineer assume no responsibility for failure to show any or all of these utilities or structures on the plans, or to show them in their exact locations. It is mutually agreed that such failure shall not be considered sufficient basis for claims for additional compensation for extra work or for increasing the pay quantities in any manner whatsoever, unless the obstruction encountered is such as to necessitate changes in the lines or grades, or requires the building of special work, provisions for which are not made in the plans, in which case, provisions in these specifications for extra work shall apply.

47. **PUBLIC UTILITIES AND OTHER PROPERTY TO BE CHANGED:** In case it is necessary to change or move the property of a public utility, such property shall not be moved or interfered with until authorized by the Town of Addison or the Engineer. The right is reserved for the Owner of public utilities to enter upon the limits of the project for the purpose of making such changes or repairs of their property that may be made

necessary by performance of the Contract. The Contractor shall be responsible for coordination with the Town of Addison and the Engineer, and all utility companies whose utility lines or streets may be affected by the proposed improvements. The Contractor shall observe the following:

- a. Prior to any excavation, the Contractor shall determine the locations of all existing water, gas, sewer, electric, telephone, telegraph, television, pipelines and other underground utilities and structures.
- b. After commencing work, the Contractor shall use every precaution to avoid interference with existing underground and surface utilities and structures, and protect them from damage.
- c. Where the locations of existing underground and surface utilities and structures are indicated, these locations are generally approximate, and all items which may be encountered during the work are not necessarily indicated. The Contractor shall determine the exact locations of all items indicated, and the existence and locations of all items not indicated.
- d. The Contractor shall repair or pay for all damage caused by his operations to all existing utility lines, public property, and private property, whether it is below ground or above ground, and he shall settle in total the cost of all damage suites which may arise as a result of his operations.
- e. To avoid unnecessary interferences or delays, the Contractor shall coordinate all utility removals, replacements and construction with the appropriate utility company, and then request written authorization from the Town of Addison or the Engineer. The Town of Addison and the Engineer will not be liable for damages due to delay as a result of the above.

48. **MAINTENANCE AND REPAIRS:** The Contractor shall maintain and keep in good repair all work contemplated under these plans, specifications, and drawings which shall include the maintenance and repair of all existing streets, storm sewer crossings, utility crossings, temporary crossings for access to adjacent property, barricades, lights, and danger signals, and all work which is necessary for the well being of the general public. In the event the Contractor fails in his obligations to properly maintain the work, the Town of Addison shall make such repairs as are necessary and the cost of such repairs shall be deducted from payment due the Contractor.

49. **PROTECTION OF WORK:** During performance and up to date of final acceptance, the Contractor shall be under the absolute obligation to protect the finished work against damage, loss or injury. In the event of damage, loss or injury, the Contractor shall promptly replace or repair such work, whichever the Town of Addison shall determine to be preferable. The obligation to deliver finished work in strict accordance with the contract prior to final acceptance shall be absolute and shall not be affected by the Town of Addison's approval of or failure to prohibit means and methods of construction used by the Contractor. All risk of loss or damage to the work shall be borne solely by the

Contractor until final acceptance of all work by the Town of Addison, as evidenced by the Town of Addison's issuance of a certificate of acceptance.

50. **PUBLIC CONVENIENCE AND SAFETY:** In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for conditions of the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and not be limited to normal working hours.

Materials stored about the work site shall be so placed, and the work shall at all times be so conducted, as to cause no greater obstruction to the traveling public than is considered necessary by the Town of Addison. The materials excavated shall be placed so as not to endanger the work or prevent free access to all fire hydrants, water valves, gas valves, manholes (telephone, telegraph or electrical conduits, and sanitary sewers) and fire alarm or police call boxes in the vicinity.

The Town of Addison reserves the right to remedy any neglect on the part of the Contractor as regards to the public convenience and safety which may come to the Town of Addison's attention, after 24 hours notice in writing to the Contractor, save in cases of emergency, when the Town of Addison shall have the right to remedy any neglect without notice; and, in either case, the cost of such work done by the Town of Addison shall be deducted from the monies due or to become due the Contractor. The Contractor shall notify the Town of Addison and the Engineer when any street is to be closed or obstructed. The Contractor shall provide for emergency vehicle access at all times.

Where the work passes over or through private property, the Town of Addison shall provide such right-of-way. The Contractor shall notify the proper representatives of any public utility, corporation, company or individual, not less than 48 hours in advance of work which might damage or interfere with the operation of their property along or adjacent to the work. The Contractor shall be responsible for all damage or injury to property of any character (except such as may be required by the provisions of the Contract Documents, or caused by agents or employees or the Town of Addison) by reason of any negligent act or omission on the part of the Contractor, his employees, agents or subcontractors, or at any time due to defective work or materials, or due to his failure to reasonably or properly prosecute the work, and said responsibility shall not be released by the fact that the work shall have been completed and accepted.

When and where any such damage or injury is done to public or private property on the part of the Contractor, he shall restore or have restored at his own cost and expense such property to a condition similar or equal to that existing before such damage was done, by repairing, rebuilding or otherwise restoring as he may be directed, or he shall make good such damage or injury in a manner acceptable to the property Town of Addison and the Engineer. In case of failure on the part of the Contractor to restore such property or make good such damage or injury, the Town of Addison may, upon 48 hour written notice under ordinary circumstances, and without notice when a nuisance or hazardous condition results, proceed to repair, rebuild or otherwise restore such property as may be determined necessary, and the cost thereof shall be deducted from any monies due or to become due to the Contractor under this contract; or where sufficient contract funds are

unavailable for this purpose, the Contractor or his surety shall reimburse the Town of Addison for all such costs.

51. **PROTECTION OF PERSONS AND PROPERTY:** The Contractor shall have the responsibility to provide and maintain all warning devices and take all precautionary measures required by law or otherwise necessary to protect persons and property while said persons or property are approaching, leaving or within the work site or any area adjacent to said work site. No separate compensation shall be paid to the Contractor for the installation or maintenance of any warning devices, barricades, lights, signs, or any other precautionary measures required by law or otherwise necessary for the protection of persons or property.

The Contractor shall assume all responsibilities to the general public in connection with the general public's immediate approach to and travel through the work site and the area adjacent to said work site.

Where the work is in or adjacent to any street, alley, sidewalk, public right-of-way or public place, the Contractor shall at his own cost and expense provide such flagmen and watchmen and furnish, erect and maintain such warning devices, barricades, lights, signs, and other precautionary measures for the protection of persons or property as may be prudent or necessary, or as required by law. The Contractor's responsibility for providing and maintaining flagmen, watchmen, warning devices, barricades, signs and lights and other precautionary measures shall not cease until the project shall have been completed and accepted by the Town of Addison, and shall cease when the Town of Addison notifies the Contractor in writing of final project acceptance.

If the Town of Addison discovers that the Contractor has failed to comply with applicable federal or state laws (by failing to furnish the necessary flagmen, warning devices, barricades, lights, signs or other precautionary measures for the protection of persons or property), the Town of Addison may order the Contractor to take such additional precautionary measures as required by law to protect persons and property.

In addition, the Contractor shall be held responsible for all damages to the work and other public or private property due to the failure of warning devices, barricades, signs, lights or other precautionary measures in protecting said property; and whenever evidence is found of such damage, the Town of Addison may order the damaged portion immediately removed and replaced by and at the cost and expense of the Contractor.

52. **TRAFFIC CONTROL:** It shall be the responsibility of the Contractor to provide traffic control during the construction as required by the State of Texas, the Town of Addison, and in accordance with the following additional requirements:

1. The Contractor shall be required to furnish barricades, flares, flagmen, etc., for the protection of the public, employees and the work.
2. The Contractor shall prosecute his work in such a manner as to create a minimum of interruption to traffic along adjacent roadways.

3. The unit price bid under the appropriate bid item of the proposal shall cover all cost for providing signage, markings, lighting, barricades, flagmen and other devices and personnel required for traffic control during construction of the project.
4. The Contractor shall not remove any regulatory sign, instructional sign, warning sign, street name sign or any other sign or signal which currently exists.

53. BARRICADES, WARNING SIGNS, DETOURS AND SEQUENCE OF WORK:

Throughout the construction operations, streets and intersections will remain open to traffic by constructing the work in stages. All streets, driveways, adjacent business and alleys shall remain open to traffic as far as is practicable.

A. General Construction: The Contractor shall plan his work sequence in a manner that will cause minimum interference with traffic during construction operations. Before beginning work on this project, the Contractor shall submit, for approval by the Town of Addison, a plan of construction operations outlining in detail a sequence of work to be followed; setting out the method of handling traffic on streets, roads and driveways along, across and adjacent to the work. If at any time during the construction, the Contractor's proposed plan of operation for handling traffic does not provide for safe comfortable movement, the Contractor shall immediately change his operations to correct the unsatisfactory conditions.

Ditches across the traffic lanes will be kept covered with a portable traffic-bearing surface at all times unless work in the ditch is in progress. Only one lane of traffic may be closed at a time when work is in progress in a ditch.

B. Safety: The Contractor shall provide, construct and maintain barricades and signs at locations set out in the plans and in the Special Provisions in accordance with the Texas Manual on "Uniform Traffic Control Devices for Streets and Highways". In addition, he shall provide and maintain such other barricades and signs as deemed necessary by the Town or the Engineer, and provide and maintain, between sunset and sunrise, a sufficient number of lights at barricades and points of danger for the protection of vehicular and pedestrian traffic.

Barricades shall be placed in such a manner as not to interfere with the sight distance of drivers entering the street from side streets.

The Contractor shall keep traveled surfaces used in his hauling operation clear and free of dirt or other material.

The Contractor shall provide and maintain qualified flagmen at such points and for such periods of time as may be required to provide for the safety and convenience of public travel and Contractor's personnel.

54. EXCAVATION SAFETY SYSTEMS

The work performed under this section of the specifications consists of providing trench safety systems consisting of shoring, sheeting, trench shield, and/or laid back slopes to meet the trench safety requirements of the Occupational Safety and Health

Administration (O.S.H.A.), as required for this project and specified herein.

A. General: Trench safety systems shall be provided by the Contractor as provided in Subpart P - Excavation, Trenching and Shoring, Part 1926 of the Code of Federal Regulations which describes safety and health regulations as administered by the U.S. Department of Labor Occupational Safety and Health Administration (O.S.H.A.). The standards specified by the O.S.H.A. Regulations shall be the minimum allowed on this project. It shall be the responsibility of the Contractor to design and install adequate trench safety systems for all trenches excavated on this project.

The Contractor shall furnish to the Town for review, prior to beginning construction activity, a Trench Safety Plan for the entire project. The trench safety plan must be prepared and sealed by a Professional Engineer registered in the State of Texas. In addition, all trench safety systems utilized in this project must be designed by a Professional Engineer registered in the State of Texas. The Contractor shall be totally responsible for the safety of all persons involved in the construction of this project.

B. Core Borings: Any core borings and soil data furnished by the Town are for the convenience of the Contractor. The Contractor shall be responsible for any additional soil or geotechnical information required. The Contractor shall be responsible for properly designed trench safety systems to be utilized for any type of subsurface condition found on this project. The furnishing of soil information by the Town of Addison in no way relieves the Contractor of this obligation. If no core borings or soil data are furnished by the Town, it shall be the Contractor's responsibility to obtain whatever geotechnical information required for preparation of trench safety systems.

C. Inspections: In addition to the inspections of the trench and trench safety systems required of the Contractor by the O.S.H.A. Regulations, the Town may further inspect the work. The Town shall have the right to reject any trench safety systems which he finds to be inadequate, and the Contractor shall immediately improve the system to comply with this specification.

D. Measurement and Payment: Measurement and payment of Trench Safety Systems shall be based on the actual linear footage of the pipe installed on the project. The payment shall be full compensation for all planning, engineering, materials, equipment, fabrications, installation, recovery and all incidental work required. All excavation and backfill in addition to that specified elsewhere in these specifications shall be considered subsidiary to this bid item.

55. TRENCH EXCAVATION, BACKFILL AND COMPACTION: Trench excavation, backfill and compaction of storm drain and utility trenches shall be in accordance with Town of Addison Standards and with details shown on the Construction Drawings.

a. Trench Excavation: If the stated maximum trench widths are exceeded, either through accident or otherwise, and if the Engineer determines that the design loadings of the pipe will be exceeded, the Contractor will be required to support the pipe with an improved trench bottom. The expense of such remedial measures shall be entirely the Contractor's own. All trenching operations shall be confined

to the width of permanent rights-of-way, permanent easements and any temporary construction easements. All excavation shall be in strict compliance with the Trench Safety Systems Special Condition of this document.

- b. Trench Backfill: Trenches shall be backfilled above the top of the embedment material with approved backfill material per Town of Addison Standards for the appropriate pipe size, pipe material, depth and soil condition.
 - c. Compaction: All trenches under proposed or existing pavement shall be compacted to within a range of 95% to 100% Standard Proctor Density. Trenches which lie outside limits of pavement shall be compacted to a minimum of 90% Standard Proctor Density (ASTM D-698).
56. **TRENCH WALLS:** The Contractor shall use shoring or a drag box in those areas where it is required to protect existing improvements. This shall be subsidiary to the linear foot cost of the pipe and not a separate pay item.
57. **PROPERTY LINES AND MONUMENTS:** The Contractor shall protect all property corner markers, and when any such markers or monuments are in danger of being disturbed, they shall be properly referenced and if disturbed shall be reset at expense of the Contractor.
58. **CONSTRUCTION STAKING:** Construction staking will not be provided by the Town of Addison or Engineer. This item will be performed by the Contractor and shall be subsidiary to other bid items. The Contractor will also be responsible for maintaining stakes. If re-staking is required for any reason, it will be the Contractor's responsibility, including associated costs.

All construction staking shall be done under the supervision of a Registered Professional Land Surveyor registered in the State of Texas. The Contractor shall submit copies of cut sheets and field books for the construction of all paving, water, wastewater, and stormwater improvements to the Town of Addison for review prior to construction of the improvements. The information on the cut sheets and field books shall include but not be limited to the following:

- a. Heading to include date, contract number, project name, surveying firm, contractor, and construction plan sheet number.
- b. Location, description of street/line and street/line name, number, letter, etc. designation.
- c. Benchmark Data: Location, description, and elevation.
- d. Slope or percent of grade of each curb line or utility line.
- e. Stations at 50 foot intervals and including all PC, PT, PI, PVC, PVI, PVT, PRC, grade changes, etc.

- f. Offset description including distance to center line or back of curb and direction of offset; left, right, east, west, etc,
 - g. Cut to subgrade, pavement, top of curb, or flowline of the street or utility being staked.
 - h. Clarifying remarks such as top of curb, gutter, pavement, subgrade, manhole, cleanout, valve, tee, cross, fire hydrant, wastewater lateral, water service, etc.
 - i. Cut sheets shall be signed by a Texas Registered Professional Land Surveyor.
59. **VENDOR'S CERTIFICATION:** All materials used in construction shall have a vendor's certified test report. Test reports shall be delivered to the Engineer before permission will be granted for use of the material. All vendors' test reports shall be subject to review by the Engineer, and shall be subject to verification by testing of samples of materials as received for use on the project. In the event additional tests are required, they shall be performed by an approved independent testing laboratory and shall be paid for by the Contractor.
60. **WATER PIPE:** All water mains twelve-inch (12") diameter and smaller shall be ANSI / AWWA C-900 PVC pressure pipe with cast iron o.d. except when a) water pipe penetrates meter vault walls and b) specific water pipe crossings as referenced on water profile sheets, in which cases the water pipe shall be Class 51 Ductile Iron, polyethylene wrapped. Pipe joints shall be rubber ring and integral thickened bell, assembled with a factory supplied lubricant. Water mains shall have a minimum class rating of 150-psi for domestic use and a minimum class rating of 200-psi for fire line applications. Joint material for PVC shall conform to ASTM F471.
61. **WASTEWATER PIPE:** All wastewater main piping shall meet the extra strength requirements of ASTM specification D3034 (SDR-35). Pipe shall have the bell and spigot type joints, consisting of integral wall section with factory installed compression rubber ring gasket, securely locked in bell groove to provide positive seal under all installation conditions. Pipe shall be laid with the bell end on the upstream side.
62. **STORM DRAINAGE PIPE:** All pipe for storm drainage improvements shall be reinforced concrete pipe (RCP), Class III, unless otherwise noted on the plans.
63. **POLYETHYLENE WRAPPING:** All valves, ductile iron pipe, cast iron fittings, and specials, shall be polyethylene wrapped. Payment for the polyethylene wrapping for these components shall be subsidiary to the various items bid for the furnishing and installing pipe complete in place. Polyethylene wrap shall precede blocking.
64. **PIPE CLEANING:** Joints shall be wiped and then inspected for proper installation by the inspectors. Each joint shall be swept daily and kept clean during installation. A temporary night plug shall be installed on all exposed pipe ends during any period of work stoppage.

65. **PLUGS:** Pipe plugs for water lines are included in the Bid Item for Water Fittings. Wastewater line plugs shall be considered incidental and shall not be a separate pay item. Plugs for storm drain lines do have separate pay items established for each size provided and shall be paid for accordingly.
66. **CEMENT STABILIZED BACKFILL:** Two (2) sack cement stabilized backfill shall be provided in wastewater pipe trenches at locations of crossings with water lines where shown on the plans and in conformance with Texas Dept. of Health Rules & Regulations for Public Water Systems. Payment for such work including all labor, tools, equipment and material necessary to complete the work shall be included in the linear foot price bid for Cement Stabilized Backfill.
67. **NON-METALLIC WATER PIPE DETECTION:** Detectable underground utility warning tapes, which can be located from the surface by a pipe detector, shall be installed directly above non-metallic pipe. The detectable tape shall be “Detect Tape” as manufactured by Allen Systems, Inc. or an approved equal, and shall consist of a minimum thickness of 0.35-mil. solid aluminum foil encased in a protective inert plastic jacket that is impervious to all known alkalis, acids, chemical reagents and solvents found in the soil. The minimum overall thickness of the tape shall be 5.5-mils. And the width shall not be less than two-inch with a medium unit weight of 2 ½ pounds per inch x 1,000 feet. The tape shall be color coded and imprinted with the messages as follow:

<u>Type of Utility</u>	<u>Color Coded</u>	<u>Legend</u>
Water BELOW	Safety Precaution Blue	CAUTION BURIED WATER LINE
Sanitary BELOW	Safety Green	CAUTION BURIED SEWER LINE

Installation of detectable tapes shall be per manufacturer’s recommendations, and shall be as close to the grade as is practical for optimum protection and detectability. Allow a minimum of 18 inches between the tape and the water line.

Payment for detectable tapes shall be included in the linear foot price bid for applicable pipe(s).

68. **PIPE EMBEDMENT:** All storm drain and utility construction shall be installed with embedment per the details shown on the plans for the appropriate pipe size, pipe material, depth and soil condition unless otherwise directed by the Town of Addison or the Engineer.
69. **REMOVALS, ADJUSTMENTS AND REPLACEMENTS:** Existing pavements, driveways, curbs, gutters, sidewalks, etc., to be removed to facilitate the construction of the improvements shall be broken up and disposed of. Care shall be exercised to leave a neat, uniform edge or joint at the excavation limits or sections removed where only portions are to be removed. The Engineer will designate the limits to be removed. Where pavements, driveways, curbs, gutters, sidewalks, etc., shall be replaced, then said

replacements shall be to the standard of the previously removed portion or better. Re-sawing of damaged edges will be at the Contractor's expense.

Existing structures such as manholes, inlets, cleanouts, valve boxes, etc. which are not the property of a private firm or company, or an individual required to move their own property, shall be adjusted, altered or reset to the required elevation and alignment. New materials and workmanship necessary shall conform to the requirements of these Specifications covering the particular Work. Salvaged materials in good condition may be used in rebuilding such structures, provided the materials are thoroughly cleaned before their use. These items shall be subsidiary to other bid items unless quantified in the proposal as a separate bid item.

All private obstructions which are indicated on the Plans to be moved, will be removed and replaced, or moved to new permanent locations by the Contractor, without additional payment to the Contractor. Any such additional item which the Contractor moves or causes to be moved for his own convenience shall be at his own expense.

70. **SHORT TERM ASPHALTIC PAVEMENT REPAIR:** The unit price bid under the appropriate bid item of the proposal shall cover all cost for providing pavement repair per the short term pavement repair detail provided in the plans.
71. **WATER FOR CONSTRUCTION:** The Contractor shall acquire a meter and make the necessary arrangements with the Town of Addison for securing and transporting all water required for construction, including water required for mixing of concrete, sprinkling, testing or flushing. There will be no separate pay item for connection into the existing water system and quantity of water required for construction purposes. The Town of Addison will furnish water for initial cleaning and sterilization of water lines. All additional water used by the Contractor for compaction or any other purpose incidental to this project may be obtained from existing hydrants along adjacent roadways. Note that the Contractor will be responsible for supplying chlorine gas or chlorinated lime (HTH) for water line sterilization.
72. **EXISTING STOCKPILES OF MATERIAL ON SITE:** NIC
73. **BORROW SOURCE:** If additional sources of earthen material are required for construction of embankment areas to complete the project to the alignment, grades and cross sections indicated on the plans, Contractor will be required to locate, obtain, excavate, deliver and place suitable fill material from an off-site source. Borrow

materials should be compatible with existing on-site materials and shall be tested by the Geotechnical Engineer (employed and paid for by the Town of Addison) for acceptance as an approved source of borrow prior to borrow operations. Item 3.6 - Borrow of the Standard Specifications for Public Works Construction, North Central Texas Council of Governments shall apply for all work performed. If borrow material is required, Contractor will be reimbursed by the Town for the work performed and the material furnished at a negotiated price between the Town and Contractor prior to commencing this work, and included as a change order to the contract.

74. **EXCESS MATERIAL:** Suitable excess material (if any) may be disposed of on this site at locations directed by the Engineer. Topsoil shall be stripped and stockpiled from locations where excess material is to be placed. The Contractor shall scarify the spoil area to a depth of 6 inches and shall place the spoil material in 6-inch lifts, compacted to ninety-five percent (95%) of the maximum density as determined by ASTM D-698 Standard Proctor Test Method at or slightly above optimum moisture content. Rock shall be broken or crushed so that the maximum dimension is 12". No rock larger than 4" will be allowed in the upper 12" of fill. After completion of filling, replace topsoil and smooth grade. Tree stumps and limbs, concrete debris, discarded materials and all unsuitable excess spoil material, including rock measuring larger than 12" in the largest dimension, shall become the property of the contractor and shall be removed from the site and disposed of by the Contractor at his expense. **THE CONTRACTOR SHALL ALSO COMPLY WITH ALL APPLICABLE LAWS GOVERNING SPILLAGE OF DEBRIS WHILE TRANSPORTING TO A DISPOSAL SITE, AND SHALL INDEMNIFY AND SAVE HARMLESS THE TOWN OF ADDISON AND THE ENGINEER FROM ALL SUITS, ACTIONS, OR CLAIMS OF ANY CHARACTER RESULTING FROM HIS ARRANGEMENTS FOR THE DISPOSAL OF SPOIL.**
75. **DURING CONSTRUCTION:** During construction of the work, the Contractor shall, at all times, keep the site of the work and adjacent premises as free from material, debris and rubbish as is practicable and shall remove same from any portion of the site if, in the opinion of the Town of Addison or the Engineer, such material, debris or rubbish constitutes a nuisance or is objectionable. In case of failure on the part of the Contractor to maintain a clean site, the Town of Addison may, upon 24 hour written notice, clean the site, and the cost thereof shall be deducted from any monies due or to become due to the Contractor under his contract; or where sufficient contract funds are unavailable for this purpose, the Contractor or his surety shall reimburse the Town of Addison for all such costs.
76. **CONSTRUCTION TRAFFIC OVER PIPE LINES:** The design of the new pipes and the design of the existing pipe have been taken into account and provided for highway live loads. It is apparent, however, that certain construction vehicles could exceed this highway load condition under shallow bury conditions. It will be the responsibility of the Contractor to protect both the new line and the existing lines from these possibly excessive loads. The Contractor shall not at any time cross the existing or new pipe with a truck delivering new pipe to the site. Any damage to the existing or new pipe will be repaired or replaced by the Contractor to the satisfaction of the Town of Addison.

In locations where it is not permissible to cross the existing or proposed pipes without additional protection, the Contractor may elect to provide additional protection of the

pipes so that more frequent crossings of the pipes are allowed. It still is, however, the responsibility of the Contractor to repair any damage to the existing or proposed lines if the damage results from any phase of his construction operation.

77. **CONTRACTOR'S CONTINUING OBLIGATION:** Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. Neither recommendation of any progress or final payment by the Town of Addison, nor the issuance of a certificate of Substantial Completion, nor any payment by Town of Addison to Contractor under the Contract Documents, nor any use or occupancy of the Work or any part thereof by Town of Addison, nor any act of acceptance by Town of Addison nor any failure to do so, nor any review and approval of a Shop Drawing or sample submission, nor the issuance of a notice of acceptability by the Town of Addison pursuant to final payment nor any correction of defective Work by Town of Addison will constitute an acceptance of Work not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents.
78. **WAIVER OF CLAIMS:** The making and acceptance of final payment will constitute:
- a. A waiver of all claims by Town of Addison against Contractor, except claims arising from unsettled Liens, from defective Work appearing after final inspection or failure to comply with the Contract Documents or the terms of any special guarantees specified therein; however, it will not constitute a waiver by Town of Addison of any rights in respect of Contractor's continuing obligations under the Contract Documents.
 - b. A waiver of all claims by Contractor against Town of Addison other than those previously made in writing and still unsettled.
79. **IRRIGATION AND SPRINKLER REPAIR:** The contractor shall maintain all existing irrigation systems within the limits of the project during the duration of the contract. The contractor shall employ a licensed irrigator who is responsible for the repair or replacement of any damage to irrigation lines, valves, controllers, sprinklers, wiring and appurtenances which are damaged during construction. This repair is subsidiary to the various other items bid. The contractor will be responsible for any vegetation that dies as a result of damage to the irrigation system and replace it with equal vegetation at his own cost.
80. **REMOVAL OF DEFECTIVE AND UNAUTHORIZED WORK:** All work which has been rejected or condemned shall be repaired; or if it cannot be repaired satisfactorily, it shall be removed and replaced at the Contractor's expense. Defective materials shall be immediately removed from the work site. Work done without line and grade having been provided; work done beyond the line or not in conformity with the grades shown on the Drawings or as provided, work done without proper inspection; or any extra or unclassified work done without written authority and prior agreement in writing as to prices, shall be at the Contractor's risk and will be considered unauthorized, and at the option of the Town of Addison may not be measured and paid for and may be ordered removed at the Contractor's expense. Upon failure of the Contractor to repair satisfactorily or to remove and replace, if so directed, rejected, unauthorized or

condemned work or materials immediately after receiving notice from the Town of Addison, the Town will, after giving written notice to the Contractor, have the authority to cause defective work to be remedied or removed and replaced, or to cause unauthorized work to be removed and to deduct the cost thereof from any monies due or to become due the Contractor.

81. **DISPOSITION AND DISPOSAL OF MATERIALS:** All materials to be removed from the site including refuse and other debris shall become the property of the Contractor and shall be disposed of outside the limits of the project. Contractor shall also comply with all applicable laws governing the spillage of debris while transporting to a disposal site.

82. **CLEAN-UP FOR FINAL ACCEPTANCE:** The Contractor shall make a final cleanup of all parts of the work before acceptance by the Town of Addison. This cleanup shall include removal of all objectionable rock and other construction materials, and in general preparing the site of the work in an orderly manner and appearance.

83. **TV INSPECTION OF WASTEWATER AND STORM DRAIN SYSTEMS:** Part of the final inspection of the wastewater and storm drain systems on this project shall include a closed circuit TV survey of the completed pipe installation, exclusive of services, and all imperfections in the installed facility revealed by the TV survey of the imperfections in the installed facilities revealed by the TV survey shall be remedied by the Contractor prior to acceptance of the project as complete. All TV survey work, including furnishing of necessary personnel, equipment and material shall be performed by the Contractor.

84. **STREET LIGHTS:** The following, or approved equal, are to be used on this project:

Street Light Type 1:

Bega Fixture 9701 MH – V240 – BEGA OLD SILVER
Pole 1108HR – BEGA OLD SILVER
Lamp MP 100/U/MED

85. **RECYCLING OF ASPHALT AND CONCRETE:** The existing asphalt pavement on Westgate Lane shall be recycled and reinstalled as base material beneath the new concrete road section. The existing pavement can be removed by cold planning where the material is pulverized, sized and mixed with an additive (asphalt emulsion or a recycling agent) to rejuvenate the existing asphalt. Ripping and crushing the asphalt, then combining the recycled asphalt with hot new aggregate and asphalt or a recycling agent at a central plant is also acceptable. If the amount of recycled asphalt material is insufficient to complete the required base course material required on this project, the Contract shall provide new hot mix asphaltic concrete material to complete the project. Recycling of the existing Marsh Lane concrete street pavement, curb and gutter, and sidewalks is also required. The crushed concrete shall be processed to meet TxDOT Item 247 Type A Grade 2. The recycled concrete meeting this requirement will be allowed in lieu of the crushed limestone flex base. If the amount of recycled concrete material is insufficient to complete the required flex base material required on this project, the Contractor shall provide new crushed limestone flex base material to complete the

project. Proof of recycling of all asphalt and concrete from this project will be required from the Contractor.

86. **PHASING OF CONSTRUCTION:** Construction of Vitruvian Park Building 201 will be on-going by others and in conjunction with this Block 200 Public Infrastructure phase of construction. The construction requirements of these projects will entail coordination and proper staging in order to complete both phases of work. It is of the utmost importance that the contractors for each of these projects work together to that end. Public Infrastructure improvements shall be constructed in the following sequence with the intention of keeping Westgate Lane open for construction operations related to Building 201.

Phase 1: Construction of Electric Duct Bank System

Phase 2: Construction of utility work along Vitruvian Way including Sanitary Sewer, Storm Drain and Electric improvements.

Phase 3: Construction of improvements along Marsh Lane and the West Private Drive including Sanitary Sewer, Storm Drain and Electric improvements.

Phase 4: Construction of utility improvements along proposed Westgate Lane.

Phase 5: Paving improvements for Vitruvian Way, West Private Drive and Westgate Lane.

87. **TOPSOIL SPREADING:** Upon completion of street paving and backfilling of curbs, the Contractor shall provide and spread a 6" layer of topsoil on all unpaved areas of the street right-of-way including medians and parkway areas. Topsoiled areas shall be fine graded to provide a smooth surface, free from lumps and clods, and graded to provide proper drainage.

88. **GRASSING:** Grassing within street rights-of-way and easements will be provided under separate contract by others. This Contractor will be responsible for grassing of all other areas disturbed by this Contractors' operations including job staging area, batch plant site, haul roads, etc. Cost of grassing for these areas shall be considered subsidiary to the cost of the project.

89. **SILICONE JOINT SEALANT:** Silicone joint sealant must be used in all instances where joint sealing applies to Portland cement concrete pavement and curbs. Payment for the use of silicone joint sealant throughout this project will in all cases be subsidiary to this contract at no extra payment.

90. **CLAIMS FOR DAMAGES OR INJURY:**

If any person files a claim against the Town of Addison, the UDR Parties or Contractor for personal injury or property damage resulting from, arising out of, or caused by, the operations of the Contractor, or any work within the limits of the project, the Contractor must either submit to the Town of Addison, a duly executed full release within thirty (30) days from the date of written claim, or immediately report the claim to his liability insurance carrier for their action in adjusting the claim. If the Contractor fails to comply with this provision within the stipulated time limit, it will be automatically deemed that the Contractor has appointed the Town as its irrevocably Attorney-In-Fact authorizing

the Town to report the claim directly with the liability insurance carrier. This provision is in and of itself a Power-of-Attorney from the Contractor to the Town which authorizes the Town to take said action on behalf of the Contractor without the necessity of the execution of any other document. If the Contractor fails to comply with the provisions of this item the Town, at its own discretion, may terminate this contract or take any other actions it deems appropriate. Any payment or portion thereof due the Contractor, whether it is a final payment, progress payment, payment out of retainage or refund payment may be withheld by the Town as is authorized by Item 1.52. Bankruptcy, insolvency or denial of liability by the insurance carrier shall not exonerate the Contractor from liability.

As a result of the additional work created to Town of Addison due to un-responded claims for damages by Contractor to third parties, Contractor shall incur penalties for failure to abide by this Special Provision.

In accordance with the obligations set forth in this Special Provision, Contractor shall respond to the claimant in writing regarding the status of the claim, including whether Contractor disputes the claim, wishes to settle, or will notify its liability insurance carrier regarding the claim. Contractor will be assessed a penalty by the Town of \$75.00 per claim, for its failure to respond to the claimant as described above within thirty days of its written notice of claim by the Town.

To ensure Contractor compliance, the Town of Addison shall be notified, by copied correspondence of responses or settlement by Contractor.

91. **MECHANICS AND MATERIALMEN'S LIEN:** The Contractor shall be required to execute a release of mechanics and materialmen's liens upon receipt of payment.
92. **CONTRACTOR'S AFFIDAVIT OF BILLS PAID:** The Contractor shall be required to execute the form provided in Section BP prior to the acceptance of the project.
93. **PROJECT RECORD DOCUMENTS:** The Contractor shall maintain record drawings and legibly annotate shop drawings to record changes made after review. A red felt-tip marking pen shall be used for all recording.

Maintenance of Documents. The Contractor shall maintain at the job site one record copy of the Contract Drawings, Specifications, Shop Drawings, Change Orders, other modification to the Contract, field test records and other documents submitted by Contractor in compliance with specification requirements. These documents shall be maintained at the job site apart from documents used for construction. These documents are not to be used for construction purposes. The documents shall be maintained in clean, legible condition. The documents shall be made available at all times for inspection by the Town.

Recording. Each document shall be labeled Project Record Copy in 2-inch high printed letters. The record documents shall be kept current. No work shall be covered until required information has been recorded.

Contract Drawings. The appropriate drawing shall be legibly marked to record, where applicable:

- a. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.
- b. Field changes of dimension and detail made during construction process.
- c. Changes made by Change Order or Supplemental Agreement.
- d. Details not on original Contract Drawings.
- e. Manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed.
- f. Changes made by Change Order or Supplemental Agreement.
- g. Other matters not originally specified.

Shop Drawing. The Contractor shall maintain the Shop Drawings as record drawings and legibly annotate shop drawings to record changes made after review.

Submittal. At the completion of the project, the Contractor shall deliver record drawings to the Town. The transmittal letter shall be accompanied, in duplicate, with:

- a. Date, project title and number.
- b. Contractor's name and address.
- c. Title and number of each record document.
- d. Certification that each document as submitted is complete and accurate.
- e. Signature of Contractor or his authorized representative.

94. **ASSIGNMENT:** Contractor shall not assign, delegate or transfer the Contract Documents or any of its rights or obligations thereunder or any interest therein without the prior written consent of the Town of Addison; however, this provision shall not restrict Contractor's hiring of subcontractors to complete the work. The Town of Addison may freely assign, delegate or transfer the Contract Documents, in whole or in part, or any of its rights or obligations thereunder or any interest therein.

95. **TOWN OF ADDISON APPROVAL:** This project is subject to final approval and acceptance by the Town of Addison. Final approval acceptance will not be given until the punch list items are completed to the Town's satisfaction and as-built drawings are given to the Town of Addison.

SECTION PS

PROJECT SIGN

PROJECT SIGN

1. Quantity

Two (2) Project Designation signs will be constructed and installed on the project site as directed by the Owner. It will be the responsibility of the Contractor to maintain the sign in a presentable condition at all times during construction. Maintenance will include painting and repairs as directed by the City Engineer or his appointee. The locations of the signs will be given to the Contractor by the Town of Addison at the Pre-Construction Meeting.

2. Material

Sign shall be constructed of 3/4-inch thick smooth finish fir plywood (Grade A-C, exterior or better).

Sign will be securely mounted to 6" x 6" square posts. Nuts and bolts will not protrude from face of sign. Posts will be mounted to a support system that will provide adequate stabilization to ensure the sign will not fall over in heavy winds. Sand bags or other techniques may be necessary to protect sign.

3. Dimensions

Size of sign will be four feet tall and six feet wide. The height and arrangement of the lettering shall be in accordance with the attached detail.

4. Paint

Sign will be one-sided and will have a white background. Text will be black, except for the Addison logo which will be a blue color approved by the City Engineer. The paint will be an outdoor paint and will be maintained throughout the project in proper order. The quality of the paint, painting, and lettering on the signs shall be approved by the City Engineer or his appointee.

5. Payment

Project Signs will be a separate pay item. This will include all labor, equipment, tools, and incidentals necessary to complete and install the work.

The Town of



**PLEASE PARDON THE TEMPORARY
INCONVENIENCE DURING THIS PROJECT**

WATER, WASTEWATER AND STORM DRAIN IMPROVEMENTS

VITRUVIAN PARK

PUBLIC INFRASTRUCTURE – BLOCK 200

CONTRACTOR: _____

ESTIMATED COMPLETION DATE: May 2017

AN ADDISON PROJECT

FOR MORE INFORMATION, PLEASE CALL 972-450-2871

SECTION TS

TECHNICAL SPECIFICATIONS

TS-1	General Requirements for Water Service
TS-2	Water Services
TS-3	Interlocking Concrete Pavers
TS-4	Electrical
TS-5	Detectable Warning Panels

TECHNICAL SPECIFICATIONS

TS -1 - GENERAL REQUIREMENTS FOR WATER SERVICE

All new meters installed in the Town of Addison shall be equipped with electronic encoder registers, programmed to read in thousand gallon increments, and equipped with touch-pad readers.

Connection Fees		
.75" = \$50.00	2" = \$400.00	6" = \$800.00
1" = \$100.00	3" = \$500.00	8" = \$1,000.00
1.5" = \$150.00	4" = \$600.00	10" = \$1,200.00

A. Domestic (potable) Use:

1. AU commercial unit applications for domestic use having flow demand's greater than 160 g.p.m. shall employ either a compound type meter, or a single-jet meter, 2", and conforming to Town of Addison Specifications. Hersey MCTW, Neptune Tru/floTM, or Badger Recordall—Compound Series are the accepted compound models at this time. Single-jet meters shall be Metron-Farnier Spectrum".
2. All services with flow capabilities 160 g.p.m. shall employ either a nutaling disc, single-\$, or turbine meter, sized (2", conforming to Town of Addison Specifications. Disc meters shall be Hersey400 Series IIS- or 500 Series IISTM, Neptune T-10-~, or Badger Recordall—Disc Series. Single-jet shall be Metron-Farmer Spectrum~, and turbine meters shall be Hersey MVRTh, Neptune HP", or Badger Recordall" Turbo Series meters.

B. Lawn Irrigation:

1. All irrigation services to 1.5" shall employ a turbine, or single-jet type meter conforming to the above guidelines.
2. Less than 1.5" irrigation meter may be disc meters, but turbine meters are preferred.
3. Connection fees are waived for Irrigation services. Fire Service:
4. Less than or equal to 2" meters shall be a turbine, or single-jet meter as described above.
5. Greater than 2" shall be either a Double Check Detector Assembly, or a Reduced Pressure Zone Detector Assembly. These assemblies shall be approved by the University of Southern California Foundation for Cross Connection Control and Hydraulic Research (USC-FCCCHR), and installed in USC approved orientations and clearances.
6. Connection fees apply; see above.

C. Backflow Prevention Assemblies:

1. All water services (except fire services > 2", see page one) shall have the appropriate BPA installed immediately after the meter. If there are space limitations or other considerations that would preclude installation in that location, the BPA may be installed inside a building or other location. There may be no unprotected taps or tees into the service between the meter and the BPA. The Town of Addison Public Works Department must approve proposed installations prior to actual

installation. All installations shall comply with USC-FCCCHR approved orientations and clearances as found in the most recent edition of the Manual of Cross-Connection Control.

2. All BPA's must be on the most current List of Approved Backflow Prevention Assemblies as published by the USC-FCCCHR.
3. The appropriate BPA will be determined by the Town of Addison Utility Division, using the most current edition of the Manual of Cross-Connection Control as published by USC-FCCCHR as a guideline. Final determination rests with the Town of Addison.
4. The plumber, contractor, and/or owner is responsible for having the BPA tested upon installation and initiation of service by a Tester certified according to TCEQ Rules for the specific type of installation (i.e. Fireline, General) and registered with the Town of Addison Utility Division. Thereafter, it will be the responsibility of the party paying the water bill, to have the BPA tested as determined by the Town of Addison Utility Division based on type of device and Degree of Hazard. Reduced Pressure Zone Assemblies shall be tested at least annually.
5. Stainless steel, brass, or nylon/plastic plugs shall be placed in all test cocks after testing. The use of Teflon tape is required to facilitate removal of plugs for future testing of the device. Plumber's putty or pipe dope is unacceptable for this installation.
6. Double Check Valve Assemblies may be placed in a meter box, but the box must be of sufficient size to provide the proper clearances for accessing, testing, and repair of the device. All above ground device installations shall be protected from freezing with apparatus designed for such use. In no case shall Reduced Pressure Zone Assemblies be permitted in a meter box or vault, or any other below grade installation.

TECHNICAL SPECIFICATIONS

TS-2 - WATER SERVICES

WATER SERVICE (Sizes 3/4" through 2")

Contractors and/or plumbers are responsible for compliance with the following specifications:

- A. The Owner/Developer, or their contractor, shall supply water meters that conform to Town specifications as to make and type (See General Requirements for Water Service). All meters shall be equipped with electronic encoder registers for connection to touch-pad readers. Touch-pads shall be mounted at the direction of the Utilities Superintendent.
- B. Meters shall be set within the Utility easement and out of vehicular traffic flow and/or parking spaces. Curb stops are to be set 6" to 12" below finished grade.
- C. To prevent the inflow of mud or silt into the box, 4" to 6" of washed pea gravel shall be placed under the meter inside the box, allowing for 2" to 6" of open space below the meter. Meter box shall be minimum 18" deep. (See Figure SM-I)
- D. Meter boxes and openings shall be large enough to allow access to, and operation of, all meter nuts' flanges/bolts, and the curb stop without obstruction.
- E. Boxes unavoidably vulnerable to vehicular traffic shall have load-bearing frames and lids designed to withstand the anticipated load. Submittal and City engineer approval is required.
- F. An approved Backflow Prevention Assembly shall be installed on all water services after the meter, with a brass or copper nipple between the meter and the Assembly of sufficient length to allow placement in separate boxes. Both meter and assembly shall be accessible for testing and repairs. It shall be the responsibility of the contractor to have the Assembly tested upon installation by a TCEQ certified tester, registered with the Town of Addison Utilities Division, who shall provide the original of the test report to the Town of Addison Utility Division prior to final, continuous connection to the City's water supply.

All companion flanges shall be elliptical brass, and all bolts & nuts shall be grade 316 stainless steel, 5/8-11 x 2 1/2" hex head.

- H. Meters shall be set level in all directions.
- I. 2" meters shall have a laying length of 17"; 1.5" meters shall have a laying length of 13". Meters may be *'compact'*, but the difference shall be made up with a strainer upstream or a spool with test port downstream from the meter. 5/8" x 3/4" meters shall have 7" laying length, 3/4" meters shall have 9" laying length, and 1" meters shall have 10 3/4" laying length. (Approval of Utility Inspector)
- J. A meter deposit is required for all meters before initiation of service. The party responsible for the water bill will make application and deposit for service to the Town of Addison Utility Billing Department. (Call 450-7081)

3/4" through 2" WATER SERVICE APPROVED MATERIALS and PROCEDURES

1. Double-strap bronze tapping saddle with CC. (AWWA taper) threads: Mueller #BR2B, Ford #202B, or McDonald #3 825. Tap shall be set at 45° of vertical on the mainline. Alternate tapping saddle #2 following.
2. Mueller Servi—Sea1™ style 502,504,506,508; 7" mm. length; Ford Style FS303-CC, or equal (Submittal to Public Works Dept. for approval).
3. Corporation stop with AWWA taper thread (CC) by conductive compression connection: Mueller H-ISO 13 or B25008 (1.5", 2"), Mueller H-15008 or H-25008 (3/4", 1"), Ford FBI000 or FI000 (1.5", 2", -6-0, -7-6, respectively), (3/4", 1", -3-0, -4-6, respectively), McDonald 4701T or 470 1BT
4. Pipe and meter size shall be determined by owner with approval of Building Inspection or Public Works/Engineering Departments: Piping shall be continuous type "K" copper from corporation to curb stop and completely embedded in sand 6" around the pipe.
5. 90 degree angle curb stop with lock-wing: Mueller H-14277 or B24276 (1.5 -2"), Ford KV43-666W-G or Fy43-777W-G (1.5'~ 2"), Mueller H-14277 or B24258 (3/4", 1"), Ford KV43-332W-G or KV43-444W-G (3/4", 1"), McDonald 4646BT or 4606BT. All companion flanges (1.5 -2") shall be brass.
6. Meter boxes shall be of sufficient size to accommodate the curb stop, meter, and all connections. They shall have a cover with reader lid. Concrete boxes shall be stacked to achieve sufficient depth (see "138cC" page one).
7. In-line curb-stops, meter yokes/setters, and/or meter risers may be considered on a case-by-case basis dependent on situation and subject to approval of Utility Inspector and/or Utility Superintendent. NQ gate valves will be allowed on the inlet side of the meter.
8. The type of Backflow Prevention Assembly required will depend upon the degree of hazard or potential hazard which exists. Contact the Utility Superintendent for further information at 972-661-1693.
9. The tapping saddle and corporation stop must be poly-wrapped (8 mil) and hand backfilled with sand to a depth of 12". Additional backfill may be done by machine, with material free of rocks and clods exceeding three (3) inches in diameter. CAUTION!! Inspection must be called for and completed ~ri~ to backfill, or tap must be re-exposed by the contractor so that the Town's representative may complete the inspection.

Lawn irrigation sprinklers are exempt from connection fees. Connection to an existing service will require a \$35.00 connection fee. See Figure SM-i for detail.

WATER SERVICE (Sizes greater than 2")

Contractors, plumbers, and/or developers are responsible for compliance with the following specifications:

- A. Provide and install mechanical joint tapping sleeve or Stainless Steel tapping sleeve (such as Mueller H-6 15 or Mueller H-304 respectively). Submittal and approval required if other.
- B. Provide and install tapping valve to meet Addison specification GV-95. 1, for resilient wedge gate valve.
- C. Provide and install piping. Piping shall conform to ANSI/AWWA C-909-98 for Molecularly Oriented PVC Pressure pipe for water distribution. Pipe shall be 150-psi minimum class rating for domestic use, and 200-psi minimum class rating for fire line applications. Submittal and approval required, if other.
- D. Fittings shall be ductile iron mechanical joint style, with restraining glands (such as MegaLug). Fittings shall be wrapped with 8-mu poly prior to backfill.
- E. Pipe embedment shall conform to NCTCOG Class "B-2", or "B+" (from Standard Specifications for Public Works Construction, Third Edition, Drawing 3020, 3030). Crushed stone shall be separated from the granular material by a layer of geotextile fabric. Variations allowed with engineer's seal and approval of City Engineer.
- F. Service meter or Fire Line DCDA shall be placed in a pre-cast concrete vault with floor and access hatch. Hatch shall be "Bilco"-type, aluminum, spring-assisted, lockable, and sufficiently sized to allow for removal of complete meter or assembly. Vault shall be placed within the public ROW, wherever possible, clear of vehicular traffic flow and/or parking areas.
- G. All meters shall be equipped with electronic encoder registers calibrated to read in 1000 U.S. gallon increments, and remote touch-pad reading devices. (See General Requirements J-Q! Water Service)
- H. The meter and/or backflow assembly and piping shall be supported with manufactured supports designed for such application. (For clarification, reference Specification for *Stanton Pipe Supports* as manufactured by Material Resources Co., Hillsboro, Oregon; 503-693-0727 –Models S89 or S92).
- I. There shall be an MJ by flange coupling adapter rn-line on the inlet side of the meter or device.

TECHNICAL SPECIFICATIONS

TS – 3 - INTERLOCKING CONCRETE PAVERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete paver units. [Concrete paver edge units.]
- B. Bedding and joint sand.

1.02 RELATED SECTIONS

- A. Curbs and Drains.
- B. Aggregate Base.
- C. Cement Treated Base.
- D. Asphalt Treated Base.
- E. Pavements, Asphalt and Concrete.
- F. Bitumen and Neoprene Setting Bed, Acrylic Fortified Mortar Setting Bed.
- G. Geotextiles.

1.03 REFERENCES

- A. American Society of Testing and Materials (ASTM):
 - 1. C 33, Specification for Concrete Aggregates.
 - 2. C 136, Method for Sieve Analysis for Fine and Coarse Aggregate.
 - 3. C 140, Sampling and Testing Concrete Masonry Units.
 - 4. C 144, Standard Specification for Aggregate for Masonry Mortar.
 - 5. C 936, Specification for Solid Interlocking Concrete Paving Units.
 - 6. C 979, Specification for Pigments for Integrally Colored Concrete.
 - 7. D 698, Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 5.5-lb (2.49 kg) Rammer and 12 in. (305 mm) drop.
 - 8. D 1557, Test Methods for Moisture Density Relations of Soil and Soil Aggregate Mixtures Using a 10-lb (4.54 kg) Rammer and 18 in. (457 mm) drop.
 - 9. D 2940, Graded Aggregate Material for Bases or Subbases for Highways or Airports.

1.04 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in the manufacture of concrete interlocking pavers for a minimum of three (3) years.
Preapproved Manufacturers meeting submittal requirements:
Pavestone Company, L. P. Plaza-Stone I & II San Marcos, TX (512)558-7283
- B. Installation shall be by a contractor and crew with at least one (1) year of experience in placing interlocking concrete pavers on projects of similar nature or dollar cost.
- C. Installation Contractor shall conform to all local, state/provincial licensing and bonding requirements.

1.05 SUBMITTALS

Since it is important to the specifier that all materials being proposed for this job are truly "equal" please submit the following for approval a minimum of 14 days prior to the bid opening:

- A. Submit product drawings and data sheets.
- B. Submit concrete paving units to indicate color, shape and surface texture. Reference drawings for color and shapes (4 pc system) shall be Large Rectangle (140 mm x 210 mm), Square (140 mm x 140 mm), Medium Rectangle (140 mm x 105 mm), and Small Rectangle (140 mm x 70 mm).
- C. Submit sieve analysis for grading of bedding and joint sand (upon award of contract).
- D. Submit test results for paver batch design from an independent testing laboratory to assure compliance of paving unit requirements to ASTM C 936.
- E. Indicate layout, pattern, and relationship of paving joints to fixtures and project formed details.
- F. Substitutions: Substitutions shall not be considered 14 days prior to bid opening for acceptance.

1.06 MOCK-UPS

- A. Install a 7 ft. x 7 ft. (2 m x 2 m) paver area as described in Article 3.02. This area will be used to determine surcharge of the bedding sand layer, joint sizes, lines, laying pattern(s), color(s), and texture of the job. This area shall be the standard from which the work will be judged. Consideration shall be given with regard to differences in age of materials from time of mock-up erection to time of actual product delivery.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver concrete pavers to the site in steel banded, plastic banded, or plastic wrapped cubes capable of transfer by fork lift or clamp lift. Unload pavers at job site in such a manner that no damage occurs to the product.
- B. Sand shall be covered with waterproof covering to prevent exposure to rainfall or removal by wind. The covering shall be secured in place.
- C. Coordinate delivery and paving schedule to minimize interference with normal use of buildings adjacent to paving.

1.08 ENVIRONMENTAL CONDITIONS

- A. Do not install sand or pavers during heavy rain or snowfall.
- B. Do not install sand and pavers over frozen base materials.
- C. Do not install frozen sand.

PART 2 PRODUCTS

2.01 CONCRETE PAVERS

Concrete pavers must have spacer bars on each unit. These insure a minimum joint width between each unit into which sand is placed. Spacer bars help prevent contact of the edges with adjacent pavers and subsequent spalling.

- A. Product shape(s), overall dimensions, color(s), and thickness of the paver(s) shall be:
- | Shape | Dimensions | Color | Thickness |
|-------|------------|-------|-----------|
|-------|------------|-------|-----------|

Reference drawings for style and color of pavers.

All shapes shall have a dappled top with a cobbled surface texture and rounded corners.

- B. Pavers shall meet the following requirements set forth in ASTM C 936, Standard Specification for Interlocking Concrete Paving Units:
1. Average compressive strength of 8,000 psi (55 MPa) with no individual unit under 7,200 psi (50 MPa).
 2. Average absorption of 5% with no unit greater than 7% when tested in accordance with ASTM C 140.
 3. Resistance to 50 freeze-thaw cycles when tested in accordance with ASTM C 67.
- C. Pigment in concrete pavers shall conform to ASTM C 979.
- D. Material shall be manufactured in individual layers on production pallets.
- E. Materials shall be manufactured to produce a solid homogeneous matrix in the produced unit.

2.02 VISUAL INSPECTION

- A. All units shall be sound and free of defects that would interfere with the proper placing of unit or impair the strength or permanence of the construction.
- B. Minor cracks incidental to the usual methods of manufacture, or chipping resulting from customary methods of handling in shipment and delivery, shall not be deemed grounds for rejection.

2.03 SAMPLING AND TESTING

- A. Manufacturer shall provide access to lots ready for delivery to the Owner or his authorized representative for testing in accordance with ASTM 936-82 for sampling of material prior to commencement of paver placement.
- B. Manufacturer shall provide a minimum of three (3) years testing backup data showing manufactured products that meet and exceed ASTM 936-82 when tested in compliance with ASTM C-140.
- C. Sampling shall be random with a minimum of nine (9) specimens per 20,000 sq. ft. per product shape and size with repeated samples taken every additional 20,000 sq. ft. or a fraction thereof.
- D. Test units in accordance with ASTM for compressive strength, absorption and dimensional tolerance. A minimum of three (3) specimens per test required for an average value. Testing of full units is preferred.

2.04 REJECTION

- A. In the event the shipment fails to conform to the specified requirements, the manufacturer may sort it, and new test units shall be selected at random by the Owner from the retained lot and tested at the expense of the manufacturer. If the second set of test units fails to conform to the specified requirements, the entire lot shall be rejected.

2.05 EXPENSE OF TESTS

- A. The expense of inspection and testing shall be borne by the Owner.

The type of sand used for bedding is often called sand that is suitable for the manufacturing of concrete. Sands vary regionally. Screenings and stone dust can be unevenly graded and have an excess amount of material passing the No. 200 (75 Hm) sieve. Bedding sands with these characteristics should not be used. Contact paver contractors local to the project and confirm sand(s) successfully used in previous similar applications. Limestone sand should not be used for bedding sand. Mason sands are typically acceptable only for joint sand, provided they meet grading requirements as shown in Table 2 of this section.

- A. Bedding and joint sand shall be clean, non-plastic, free from deleterious or foreign matter. The sand shall be natural or manufactured from crushed rock. Limestone screenings or stone dust shall not be used. When concrete pavers are subject to vehicular traffic, the sands shall be as hard as practically available.
- B. Grading of sand samples for the bedding course and joints shall be done according to ASTM C 136. The bedding sand shall conform to the grading requirements of ASTM C 33 as shown in Table 1.

Table 1
Grading Requirements for Bedding Sand

ASTM C 33	
Sieve Size	Percent Passing
3/8 in. (9.5 mm)	100
No. 4 (4.75 mm)	95 to 100
No. 8 (2.36 mm)	85 to 100
No. 16 (1.18 mm)	50 to 85
No. 30 (600 µm)	25 to 60
No. 50 (300 µm)	10 to 30
No. 100 (150 µm)	2 to 10

Bedding sand may be used for joint sand. However, extra effort in sweeping and compacting the pavers may be required in order to completely fill the joints. If joint sand other than bedding sand is used, the gradations shown in Table 2 are recommended. Joint sand should never be used for bedding sand.

- C. The joint sand shall conform to the grading requirements of ASTM C 144 as shown in Table 2 below:

Table 2
Grading for Joint Sand

ASTM C 144	
Sieve Size	Natural Sand Percent Passing
No. 4 (4.75 mm)	100
No. 8 (2.36 mm)	95 to 100
No. 16 (1.18 mm)	70 to 100
No. 30 (600 µm)	40 to 75
No. 50 (300 µm)	10 to 35
No. 100 (150 µm)	2 to 15
No. 200 (75 µm)	0

PART 3 EXECUTION

3.01 EXAMINATION

For installations on a compacted aggregate base and soil subgrade, the specifier should be aware that the top surface of the pavers may be 1/8 to 1/4 in. (3 to 6 mm) above the final elevations after compaction. This difference in initial and final elevations is to compensate for possible minor settling.

- A. Verify that subgrade preparation, compacted density and elevations conform to the specifications. Compaction of the soil subgrade to at least 95% Standard Proctor Density per ASTM D 698 is recommended. Higher density, or compaction to ASTM D 1557 may be necessary for areas subject to continual vehicular traffic. Stabilization of the subgrade and/or base material may be necessary with weak or saturated subgrade soils. The Architect/Engineer should inspect subgrade preparation, elevations, and conduct density tests for conformance to specifications.
- B. Verify that geotextiles, if applicable, have been placed according to specifications.
- C. Verify that aggregate base materials, thickness, compaction, surface tolerances, and elevations conform to the specifications.

Local aggregate base materials typical to those used for flexible pavements or those conforming to ASTM D 2940 are recommended. Compaction to not less than 95% Proctor Density in accordance with ASTM D 698 is recommended for pedestrian areas. Compaction to not less than 98% Modified Proctor Density according to ASTM D 1557 is recommended for vehicular areas. The aggregate base should be spread and compacted in uniform layers not exceeding 6 in. (150 mm) thickness. Recommended base surface tolerance should be plus or minus 3/8 in. (10 mm) over a 10 ft. (3 m) straight edge. The Architect/Engineer should inspect geotextile materials and placement (if applicable), base preparation, surface tolerances, elevations, and conduct density tests for conformance to specifications.

Mechanical tampers are recommended for compaction of soil subgrade and aggregate base around lamp standards, utility structures, building edges, curbs, tree wells and other protrusions. In areas not accessible to roller compaction equipment, compact to specified density with mechanical tampers.

- D. Verify location, type, installation and elevations of edge restraints around the perimeter area to be paved.
- E. Verify that base is dry, uniform, even, and ready to support sand, pavers, and imposed loads.
- F. Beginning of bedding sand and paver installation means acceptance of base and edge restraints.

3.02 INSTALLATION

- A. Spread the sand evenly over the base course and screed to a nominal 1 in. (25 mm) thickness, not exceeding 1 1/2 in. (40 mm) thickness. The screeded sand should not be disturbed. Place sufficient sand to stay ahead of the laid pavers. Do not use the bedding sand to fill depressions in the base surface.
- B. Ensure that pavers are free of foreign materials before installation.
- C. Lay the pavers in the pattern(s) as shown on the drawings. Maintain straight pattern lines.
- D. Joints between the pavers on average shall be between 1/16 in. and 3/16 in. (2 mm to 5 mm) wide.

Some paver shapes require a larger joint. Consult manufacturer for recommended joint widths.

- E. Fill gaps at the edges of the paved area with cut pavers or edge units.

Units cut no smaller than one-third of a whole paver are recommended along edges subject to vehicular traffic.

- F. Cut pavers to be placed along the edge with a double blade paver splitter or masonry saw.
- G. Use a low amplitude, high frequency plate vibrator to vibrate the pavers into the sand. Use Table 3 below to select size of compaction equipment:

Table 3

Paver Thickness	Minimum Centrifugal Compaction Force
60 mm	3000 lbs. (13 kN)
80 mm	5000 lbs. (22 kN)

- H. Vibrate the pavers, sweeping dry joint sand into the joints and vibrating until they are full. This will require at least two or three passes with the vibrator. Do not vibrate within 3 ft. (1 m) of the unrestrained edges of the paving units.
- I. All work to within 3 ft. (1 m) of the laying face must be left fully compacted with sand-filled joints at the completion of each day.
- J. Sweep off excess sand when the job is complete.
- K. The final surface elevations shall not deviate more than 3/8 in. (10 mm) under a 10 ft. (3 m) long straightedge.
- L. The surface elevation of pavers shall be 1/8 in. to 1/4 in. (3 to 6 mm) above adjacent drainage inlets, concrete collars or channels.
- M. The resanding as necessary of paver joints shall be accomplished by contractor for a period of 90 days after completion of work.

3.03 FIELD QUALITY CONTROL

- A. After removal of excess sand, check final elevations for conformance to the drawings.

END OF SECTION

TECHNICAL SPECIFICATIONS

TS-4 - ELECTRICAL

Table of Contents

16010	General Requirements for Electrical Work
16111	Raceways and Fittings
16120	Wire and Cable
16135	Precast Electrical Manholes and Pullboxes
16410	Underground Electrical Distribution
16450	Grounding
16503	Poles and Standards
16530	Street Lighting

SECTION 16010

GENERAL REQUIREMENTS FOR ELECTRICAL WORK

PART 1 - GENERAL

1.1 DESCRIPTION

- A. General Requirements for Electrical Work are intended to be complementary to General Requirements of Construction Contract.
- B. Work Included: Provide complete electrical items where shown on Drawings, as specified herein, and as needed for complete and proper installation including, but not necessarily limited to following summary of Work.
 - 1. Electrical work will consist of the installation of pedestrian, roadway/pedestrian and parking lot fixtures and poles. Power for pedestrian and roadway fixtures will be provided by (2) new utility services. Parking lot fixtures will be served from existing Minol parking lot circuits.

1.2 QUALITY ASSURANCE AND APPLICABLE STANDARDS

- A. Use adequate numbers of skilled workers thoroughly trained and experienced in necessary crafts and completely familiar with specified requirements and methods needed for proper performance of Work of this Division. Ensure that there is minimum of one licensed journeyman electrician, on job site whenever Division 16 Work is being performed.
- B. Without additional cost, provide labor and materials as required to complete Work of this Division in accordance with requirements of Governmental Agencies having jurisdiction, regardless of whether materials and associated labor are called for elsewhere in these Contract Documents.
- C. Codes: Electrical work shall conform to requirements and recommendations of latest edition of National Electrical Code and local codes and ordinances. When codes conflict, more stringent requirements shall govern.
- D. Materials incorporated into or used in conjunction with Work provided in this Division shall be change-of-century compliant. Century 1900 and 2000 values shall be processed correctly without abnormally ending and date values processed by applicable software shall contain correct century and include at minimum: date data century recognition, calculations that accommodate same century and multiple century formulas and date values, and date interface values that reflect century. Materials and equipment shall not contain timers, clocks, counters, or other limiting designs or routines that cause items to be erased, inoperable, or otherwise incapable of being used in full manner for which designed after occurrence or lapse of triggering event. Materials and equipment shall be warranted to not cause other materials, equipment, or systems to become erased, contaminated, inoperable, or otherwise incapable of being used in intended manner.
- E. Standards: Specifications and Standards of following organizations are by reference made part of these Specifications. Electrical Work, unless otherwise indicated, shall comply with requirements and recommendations wherever applicable:
 - 1. Association of Edison Illuminating Companies (AEIC)
 - 2. American National Standards Institute (ANSI)

3. American Society for Testing and Materials (ASTM)
4. Certified Ballast Manufacturers (CBM)
5. Electrical Testing Laboratories (ETL)
6. Institute of Electrical and Electronic Engineers (IEEE)
7. Insulated Power Cable Engineers Association (IPCEA)
8. National Bureau of Standards (NBS)
9. National Electrical Contractors Association (NECA)
10. National Electrical Manufacturer's Association (NEMA)
11. National Fire Protection Association (NFPA)
12. Radio-Television Manufacturer's Association (RTMA)
13. Reflector Luminaire Manufacturers (RLM)
14. Underwriters' Laboratories, Inc. (UL)

1.3 REQUIREMENTS OF REGULATORY AGENCIES

- A. Requirements and recommendations of latest editions of Occupational Safety and Health Act (OSHA), Americans with Disabilities Act (ADA), and Texas Accessibility Standards (TAS) are by reference made part of these Specifications. Work shall comply with requirements and recommendations wherever applicable.

1.4 RELATED WORK SPECIFIED ELSEWHERE

- A. Other Divisions of Contract Documents. Refer to each Division's Specifications and Drawings for requirements.

1.5 DEFINITIONS

- A. Terms *furnish*, *install*, and *provide* are used interchangeably and shall mean to furnish and install, complete and ready for intended use.

1.6 SUBMITTALS

- A. Comply with pertinent provisions of Division 1.
- B. Submittals required of materials and equipment include following:
 1. Materials list of items proposed to be provided under Division 16.
 2. Manufacturer's specifications and other data needed to prove compliance with specified requirements. Term "Compliance" is understood to mean that Contractor certifies that submitted equipment meets or exceeds Contract Document requirements. Items that do not clearly meet this definition should be identified and explained as required in following paragraph.
 3. Explain with enough detail so that it can easily be determined that item complies with functional intent. List disadvantages or advantages of proposed item versus specified item. Submit technical data sheets and/or pictures and diagrams to support and clarify. Organize in clear and concise format. Substitutions must be approved in writing by Engineer. Engineer's decision shall be final.
 4. Allow minimum of 10 working days for review of each submittal and re-submittal.
 5. Items of equipment that are not accepted in writing as approved equal shall be replaced or revised to comply with Contract Documents at Contractor's expense.

6. The manufacturer's recommended installation procedures shall become basis for accepting or rejecting actual installation procedures used on Work.
 7. Shop drawings shall consist of detailed drawings with dimensions, schedules, weights, capacities, installation details and pertinent information needed to describe the material or equipment.
- C. Submittals required of materials and equipment under this Division include following listed items not supplied by Owner. These submittal requirements are intended to be complimentary to requirements that may be listed in individual sections. In event of conflict, more stringent requirement shall apply.
1. Conductors and Cables
 - a. Submit product data for each specified product.
 - b. Submit tabular list of wire and wiring systems that will be increased in capacity or size to comply with Section 16120 and/or similar requirements shown on Drawings. List shall include size shown on Drawings, proposed increase to comply with Section 16120, and proposed installed length.
 2. Raceways and Boxes
 - a. Submit product data for surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
 - b. Submit Shop Drawings including layout drawings showing components and wiring for nonstandard boxes, enclosures, and cabinets.
 3. Grounding
 - a. Submit product data for grounding rods, connectors and connection materials, and grounding fittings.
 4. Exterior Lighting
 - a. Submit product data describing fixtures, lamps, ballasts, poles, and accessories. Arrange product data for fixtures in order of fixture designation. Include data on features, poles, accessories, and finishes.
 - b. Submit outline drawings indicating dimensions and principal features of fixtures and poles.
 - c. Submit electrical ratings and photometric data including certified results of laboratory tests for fixtures and lamps.
 - d. Submit wind resistance calculations, certified by registered professional engineer.
 - e. Submit Shop Drawings detailing nonstandard fixtures and poles and indicating dimensions, weights, and methods of field assembly, components, and accessories.
 - f. Submit wiring diagrams detailing wiring for control system showing both factory-installed and field-installed wiring for each specific system, which differentiates between factory-installed and field-installed wiring.

- g. Submit anchor-bolt templates, keyed to specific poles and certified by manufacturer.
 - h. Submit maintenance data for products to include in operation and maintenance manual specified in this Section.
 - i. Submit lamp data for each lamp type.
 - j. Submit ballast data.
- 5. Record Documents. Refer to "Project Record Documents" Paragraph of this Section.
 - 6. Operation and Maintenance Data. Refer to "Operation and Maintenance Data" paragraph of this Section.
- D. Resubmittals of rejected submittals shall be limited to one (1) in number. Costs for processing subsequent resubmittals in excess of the first resubmittal, resulting from the Contractor's disregard of Engineer's primary submittal rejection comments, shall be borne by the Contractor. Costs shall be based on Engineer's hourly rates as published in their current professional fee schedules and shall also include reimbursable costs for delivery, mailing, and photocopies at direct cost fifteen percent (15%).

1.7 SUBSTITUTIONS

- A. The Contract Documents list manufacturers' names and catalog numbers followed by phrase "or equivalent" are to establish a standard of quality and utility for the specified items and to provide a dimensional reference to the scaled drawings.
- B. Submittals for "equivalent" items shall include the following data, which is not necessarily required for specified items which list the manufacturer and catalog number:
 - 1. Performance characteristics.
 - 2. Materials.
 - 3. Finish.
 - 4. Certification of conformance with specified codes and standards.
 - 5. Manufacturer's specifications and other data needed to prove compliance with specified requirements. Term "compliance" is understood to mean that the submitted equipment will meet or exceed the Contract Document requirements. Items that do not clearly meet this definition shall be identified and explained as required in following Paragraph.
 - 6. Identify difference between specified equipment and proposed substituted equipment. Explain with enough detail so that /Owner can easily determine that item complies with functional intent. List disadvantages or advantages of proposed item versus specified item. Submit technical data sheets and/or pictures and diagrams to support and clarify. Organize in clear and concise format. Engineer shall approve substitutions in writing. Engineer's decision shall be final.
- C. Submittals of "equivalent" components or systems may be rejected if:

1. Material or equipment would necessitate alteration of mechanical, electrical, architectural, or structural design.
 2. Dimensions vary from specified material or equipment so that accessibility or clearances are impaired or Work of other trades is adversely affected.
- D. Proposed substitutions for materials or equipment must be submitted 10 days prior to final bid date for consideration as approved equals. Otherwise, substitutions will not be permitted. Only prime bidders shall make proposals for substitutions.
- E. No substitution shall be made unless authorized in writing by Architect/Engineer. Should substitution be accepted, and should substitute material prove defective or otherwise unsatisfactory for service intended, and within guarantee period, replace this material or equipment with material or equipment specified, to satisfaction of Engineer and at no cost to Owner.
- 1.8 **ORDINANCES, PERMITS, METERS, UTILITIES AND ROYALTIES**
- A. Purchase all necessary permits and licenses necessary for completion of the Work. Pay all lawful fees required and necessary pursuant in obtaining said permits and licenses. Required certificates of approvals and inspections by local governing and regulating authorities.
 - B. Pay all fees required for connection of utility power and telephone services required for the Work.
 - C. Pay royalty payments or fees required for use of patented equipment or systems. Defend lawsuits or claims for infringement of patent rights and hold Owner and/or Engineer harmless from loss as result of said suits or claims.
- 1.9 **COMPATIBILITY OF EQUIPMENT**
- A. Assume full responsibility for satisfactory operation of component parts of electrical systems. Assure compatibility of equipment and performance of integrated systems in accordance with requirements of the Construction Documents. Notify the Engineer before submitting a bid should Specifications or Drawings make acceptance of responsibility impossible, prohibitive, or restrictive. The bid shall be accompanied by a written statement listing any objections or exceptions to the applicable specification section and/or drawing.
- 1.10 **UTILITIES AND TEMPORARY POWER**
- A. Verify location and capacity of all existing utility services before starting Work. The locations and sizes of electrical lines are shown in accordance with data secured from Owner's survey. The data shown is offered as estimating guide without guarantee of accuracy.
- 1.11 **EXCAVATION AND BACKFILLING**
- A. Perform excavation and backfilling in strict accordance with Section 02161, including trench safety requirements.
 - B. Perform excavation and backfilling associated with Work in strict accordance with provisions of these Specifications, including trench safety requirements.

- C. Perform excavation and backfilling necessary for installation of Work. This shall include shoring and pumping in ditches to keep them in dry condition until Work has been installed. Shoring required to protect excavation and safeguard employees shall be properly performed.
- D. Excavations shall be made to proper depth, with allowances made for floor slabs, forms, beams, etc. Ground under conduits shall be well compacted before conduits are installed.
- E. Exterior conduits shall be installed with minimum of 36 inches of cover below finished grade, unless otherwise indicated or required by local ordinances. Exterior conduit shall be installed with minimum of 12 inches of cover below finished paving grade, unless otherwise indicated or required by local ordinances.
- F. Backfilling shall be made with selected soil, free from rocks and debris and shall be pneumatically tamped with 6-inch layers to secure field density ratio of 90 percent as defined by ASTM Designation D698-57T (Proctor Soil Compaction Test).
- G. Excavated materials not suitable and not used in backfill shall be removed from site.
- H. Field verify locations of underground utilities. If existing utilities are damaged, they shall be repaired at no cost to Owner.
- I. Restore all lime stabilization and replace concrete, curbs, paving and other surface improvements cut during excavation to original condition.

1.12 FLASHINGS, SLEEVES, AND INSERTS

- A. Furnish and install flashings where conduits pass through outside walls. Flashings shall be properly formed to fit around conduit and shall be caulked, with 790 Silicone Building Sealant by Dow Corning Corporation, so as to make watertight seal between conduit and building.
- B. Unless otherwise specified, install sleeves for each conduit where it may pass through interior walls or floors. Galvanized 22 gage sheet iron sleeves shall be used. Finish flush with each finished wall surface. In pipe chases, the sleeve shall extend 1-1/2 inches above floor slab and shall be watertight.
- C. Raceways that pass through concrete beams or walls and masonry exterior walls shall be provided with galvanized wrought iron pipe sleeves, unless shown otherwise on drawings. Inside diameter of these sleeves shall be at least 1/2 inch greater than outside diameters of service pipes. After pipes are installed in these sleeves, fill annular space between pipes and sleeves with 790 Silicone Building Sealant by Dow Corning Corporation. Completed installation shall be watertight.
- D. Penetrations through walls, floors and ceilings shall be done in manner to maintain integrity of fire rating of respective wall, floor, or ceiling.
- E. Reference Section 07902 for additional sealant requirements. Where conflicts occur with the specified requirements, the more stringent shall apply.

1.13 CUTTING AND PATCHING

- A. Perform cutting and patching in strict accordance with provisions of these Specifications and following:

1. Coordinate Work to minimize cutting and patching.
 2. Use adequate number of skilled workers who are thoroughly trained and experienced in necessary crafts and who are completely familiar with specified requirements and methods needed for proper performance of Work.
- B. Request for Engineer's consent:
1. Prior to cutting which affects structural safety, submit a written request to Engineer for permission to proceed with cutting.
 2. When conditions of Work or schedule require a change of materials or methods for cutting and patching, notify Engineer and secure written permission to proceed with the work.
- C. Perform cutting and demolition using methods that will prevent damage to other portions of Work.
- D. Perform fitting and adjusting to provide a finished installation complying with specified tolerances and finishes.

1.14 SURFACE CONDITIONS

- A. Examine areas and conditions under which Work of this Division will be performed. Work required to correct conditions detrimental to timely and proper completion of Work shall be included as part of Work of this Division. Do not proceed until unsatisfactory conditions are corrected.

1.15 CONSTRUCTION REQUIREMENTS

- A. Drawings show arrangements of Work. Rearrangement of spaces and equipment will be considered when Project conditions make this necessary and/or materials or equipment can be installed to better advantage. Prior to proceeding with Work, coordinate with various trades to prepare and submit five (5) copies of Drawings of proposed arrangement for Engineer's review. Allow minimum of 10 working days for review.
- B. Installation or rearrangement of equipment and space for Contractor's convenience or to accommodate material or equipment substitutions will be considered. Assume responsibility for rearrangement of equipment and space and have Engineer review change before proceeding with Work. Request for changes shall be accompanied by Shop Drawings of affected equipment and space. Identify proposed monetary credits or other benefits. Allow minimum of 10 working days for review.
- C. Properly locate and size all required pipe sleeves and slots, holes, or openings in structure.

1.16 PREPARATION AND COORDINATION

- A. Coordinate the work in strict accordance with the Contract Documents as follows:
- B. Information on the Drawings and in these Specifications is as accurate as could be secured, but absolute accuracy is not guaranteed. The drawings are diagrammatic, and the exact locations, distances, levels, and other conditions shall be governed by actual construction. The drawings and specifications shall be for guidance.

- C. Field verify measurements. No extra compensation will be allowed because of differences between Work shown on Drawings and actual site measurements.

1.17 PROJECT RECORD DOCUMENTS

- A. Provide Project record documents associated with Work in accordance with provisions of these Specifications. Refer to Sections 01700 and 01730 for additional requirements.
- B. Throughout progress of the Work, maintain accurate record of all changes in Contract Documents (Drawings and Specifications). Changes shall include Addendums issued during bidding and location of electrical service lines, receptacles, and outside utilities.
- C. Delegate responsibility for maintenance of record documents to one person on Contractor's staff.
- D. Accuracy of Records
 - 1. Thoroughly coordinate changes within record documents, making adequate and proper entries on each page of Specifications and each sheet of Drawings and other documents where required to show change properly. Match symbology and format of base documents.
 - 2. Accuracy of records shall be such that future search for items shown in Contract Documents may rely reasonably on information obtained from approved Project record documents.
- E. Maintain a job set of record documents protected from deterioration and from loss and damage until completion of Work. Transfer all recorded data to final Project record documents.
- F. Making Entries on Drawings
 - 1. Using erasable colored pencil (not ink or indelible pencil), clearly describe change by graphic line and note as required.
 - 2. Date entries.
 - 3. Call attention to entry by "cloud" drawn around area or areas affected.
 - 4. In event of overlapping changes, use different colors for overlapping changes.
 - 5. Make entries within 24 hours after receipt of information that changes have occurred.
 - 6. Maintain base drawing format and use same symbology.
 - 7. Convert field mark-ups to finished CADD record drawings when required in this Section.
- G. Conversion of Schematic Layouts
 - a. The purpose of the final Project Record Documents is to provide factual information regarding all aspects of the Work, both concealed and visible, to enable future modification of the Work to proceed without lengthy and expensive site measurement, investigation, and examination.

2. Provide CADD electronic files in dwg Format using AutoCAD Release 2000 software. Upon written request, completion of a release form, and payment of the Engineer's standard fee of \$200 plus applicable sales tax for a set-up charge and \$25 per drawing plus applicable sales tax for copies of such files, Engineer will provide AutoCAD Release 2000 electronic files of base Contract Drawings in dwg format on 3-1/2 inch electronic or on compact disc. Engineer will also provide a list of drawing layers and names that shall be maintained.
3. Provide completed record drawings on electronic 3-1/2" disks or CD and one mylar film reproducible of each drawing.
4. Refer to Section 01770 for additional requirements.

H. Final Project Record Documents

1. Provide CADD Electronic files in .dwg format using AutoCAD Release 14 software. Upon written request, Engineer will provide AutoCAD Release 14 electronic files of base Contract Drawings in .dwg format on 3-1/2-inch electronic disks at no cost. Engineer will also provide a list of drawing layers and names that shall be maintained in record set.
2. Provide completed record drawings on electronic 3-1/2-inch disks and one reproducible Mylar film of each drawing.
3. Refer to Section 01720 for additional requirements.

1.18 OPERATION AND MAINTENANCE DATA

- A. Submit two copies of preliminary draft of proposed manual or manuals to Engineer for review and comments. Allow minimum of 10 working days for review. Refer to Sections 0130, 01700 and 01730 for additional requirements.
- B. Submit approved manual to Engineer prior to indoctrination of operation and maintenance personnel.
- C. Where instruction manuals are required for submittal, they shall be prepared in accordance with the following:

Format:

Size:

8-1/2-inch by 11-inch

Paper:

White bond, at least 20 pound weight

Text:

Neatly written or printed

Drawings:

11 inches in height preferable; bind in with text; foldout acceptable; larger drawings acceptable but fold to fit within Manual and provide drawing pocket inside rear cover or bind in with text.

Flysheets:

Separate each section of Manual with neatly prepared flysheets briefly describing contents of ensuing section; flysheets may be

in color.

Binding: Use heavy-duty plastic or fiberboard covers with binding mechanism concealed inside manual; 3-ring binders will be acceptable; binding is subject to **Engineer's** approval.

Measurements: Provide measurements in U.S. standard units (e.g., feet, inches, and pounds). Where items may be expected to be measured within 10 years in accordance with metric formulae, provide additional measurements in "International System of Units" (SI).

Provide front and back covers for each manual, using durable material approved by Engineer, and clearly identified on or through cover with at least following information:

OPERATING AND MAINTENANCE INSTRUCTIONS

Name and Address of Work

Name of Contractor

General subject of this manual

Space for approval signature of Engineer and approval date[s]

E. Contents: Include at least following:

1. Neatly typewritten index near front of Manual, giving immediate information as to location within manual of emergency information regarding installation.
2. Complete instructions regarding operation and maintenance of equipment involved including lubrication, disassembly, and reassembly.
3. Complete nomenclature of parts of equipment.
4. Complete nomenclature and part number of replaceable parts, name and address of nearest vendor and other data pertinent to procurement procedures.
5. Copy of guarantees and warranties issued.
6. Manufacturer's bulletins, cuts, and descriptive data, where pertinent, clearly indicating precise items included in this installation and deleting, or otherwise clearly indicating, manufacturers' data with which this installation is not concerned.
7. Other data as required in pertinent Sections of these Specifications.

1.19 TESTING AND INSPECTION

- A. Provide personnel and equipment, make required tests, and secure required approvals from Engineer and Governmental Agencies having jurisdiction.
- B. Make written notice to Engineer adequately in advance of each of following stages of construction:
 1. When rough-in is complete, but not covered.

2. At completion of Work of this Division.
 3. In underground condition prior to placing backfill, concrete floor slab, and when associated electrical Work is in place.
- C. When material or workmanship is found to not comply with specified requirements, remove items from job site and replace them with items complying with specified requirements at no additional cost to Owner. This shall be performed within 3 days after receipt of written notice of noncompliance.
 - D. In Engineer's presence, test parts of electrical system and prove that items provided under this Division function electrically in required manner.

1.20 WARRANTY

- A. Warrant equipment and workmanship for period of one year after date of substantial completion and replace or repair faulty equipment or installation at no cost to Owner for service during this period, in accordance with requirements of Division 1.
- B. Warranty shall not void specific warranties issued by manufacturers for greater periods of time or void rights guaranteed to Owner by law.
- C. Warranties shall be in writing in form satisfactory to Owner, and shall be delivered to Owner before final payment is made.

1.21 PROJECT COMPLETION

- A. Upon completion of Work of this Division, thoroughly clean exposed portions of electrical installation, removing traces of soil, labels, grease, oil, and other foreign material, and using only type cleaner recommended by manufacturer of item being cleaned.
- B. Thoroughly indoctrinate Owner's operation and maintenance personnel in contents of operations and maintenance manual required to be submitted as part of this Division of these Specifications.

END OF SECTION 16010

SECTION 16111
RACEWAYS AND FITTINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the contract, including General and Supplementary Conditions, apply to the Work specified in this Section.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. All other Sections of Division 16.
- B. All other Divisions of the Contract Documents. Refer to each Division's Specifications and Drawings for requirements.

1.3 SCOPE

- A. Provide all equipment, materials, labor, supervision, and services necessary for or incidental to the installation of a complete and operating electrical raceway system, as indicated on the Drawings and as specified.
- B. Work included:
 - 1. Rigid metal conduit and fittings
 - 2. Rigid metal and fittings with PVC coated jacket
 - 3. Non-metallic conduit and fittings

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Without additional cost to the Owner, provide such other labor and materials as are required to complete the work of this Section in accordance to the requirements of governmental agencies having jurisdiction, regardless of whether such materials and associated labor are called for elsewhere in these Contract Documents.
- C. When requested, provide the Architect with manufacturer's certificates that confirm that materials meet or exceed minimum requirements as specified.

PART 2 - PRODUCTS

2.1 CONDUITS AND FITTINGS

- A. Provide metal conduits, tubing, fittings, and couplings of types, grades, sizes, and weights (wall thicknesses) for each service indicated. Where types and grades are not indicated, provide proper selection determined by installer to fulfill wiring requirements and comply with applicable portions of NEC for raceways.
- B. Rigid Metal Conduit and Fittings
 - 1. Rigid steel conduit: ANSI C80.1
 - 2. Fittings and conduit bodies: ANSI/NEMA FB 1; threaded type, material to match conduit.
- C. Plastic Conduit and Fittings
 - 1. Conduit: NEMA TC 2; Schedule 40 PVC
 - 2. Fittings and Conduit Bodies: NEMA TC 3

2.2 CONDUIT SUPPORTS

- A. Conduit Clamps, Straps, and Supports: Steel or malleable iron

PART 3 - EXECUTION

3.1 CONDUIT SIZING, ARRANGEMENT, AND SUPPORT

- A. Size of conduit shall be as indicated on the drawings or sized for conductor type installed, whichever is larger. Size all conduits in accordance with the NEC. Minimum conduit size shall be $\frac{3}{4}$ inch.
- B. Arrange conduit to maintain maximum headroom and present a neat appearance.
- C. Route exposed conduit and conduit above accessible ceilings parallel and perpendicular to walls and adjacent piping.
- D. Maintain minimum 6-inch clearance between conduit and piping. Maintain 12-inch clearance between conduit and heat sources such as flues, steam pipes, and heating appliances.
- E. Arrange conduit supports to prevent distortion of alignment by wire pulling operations. Fasten conduit using galvanized straps, lay-in adjustable hangers, clevis hangers, or bolted split stamped galvanized hangers.
- F. Group conduit in parallel runs where practical and use conduit rack constructed of steel channel with conduit straps or clamps.
- G. Do not fasten conduit with wire or perforated pipe straps. Remove all wire used for temporary conduit support during construction, before conductors are pulled.

3.2 CONDUIT INSTALLATION

- A. Cut conduit square using a saw or pipe cutter; de-burr cut ends.
- B. Bring conduit to the shoulder of fittings and couplings and fasten securely.
- C. Use conduit hubs for fastening conduit to cast boxes and for fastening conduit to sheet metal boxes in damp or wet locations.
- D. Install no more than the equivalent of three 90-degree bends between boxes.
- E. Use conduit bodies to make sharp changes in direction, as around beams.
- F. Use hydraulic one-shot conduit bender or factory elbows for bends in conduit larger than 2-inches in size.
- G. Avoid moisture traps where possible; where unavoidable, provide junction box with drain fitting at conduit low point.
- H. Use suitable conduit caps to protect installed conduit against entrance of dirt and moisture.
- I. Provide a pull tape for spare empty conduits. The tape shall be fiberglass reinforced polyester tape with distance marking in feet continuous along its length. Furnish T&B or Greenlee products.
- J. Install expansion joints where conduit crosses building expansion joints.
- K. Where conduit penetrates fire-rated walls and floors, provide mechanical firestop fittings with UL listed fire rating equal to wall or floor rating. Seal opening around conduit with UL listed foamed silicone elastomer compound.
- L. Route conduit through roof openings for piping and ductwork where possible; otherwise route through roof jack with pitch pocket.
- M. Maximum size conduit in slabs above grade: 3/4 inch.
- N. Make joints in accordance with manufacturers' written instructions.
- O. Provide plastic warning tape for underground conduit or duct bank installations. Install warning tape directly above conduit one foot below finished grade or as shown on drawings.
- P. Sand for intermediate fill around underground conduits shall be washed sand, suitable for concrete or masonry. Reference Section 16010 for additional backfill and excavation requirements.

3.3 CONDUIT INSTALLATION SCHEDULE

- A. Underground installations more than two feet from foundation wall: Schedule 40 plastic conduit.
- B. Installations underground within 2 feet of foundation wall: Rigid steel conduit with PVC jacket.

- C. In slab or concrete above grade: Rigid steel conduit.
- D. Exposed outdoor locations: Rigid steel conduit.
- E. Installations below concrete slab: Schedule 40 PVC conduit.

END OF SECTION 16111

SECTION 16120

WIRE AND CABLE (600 VOLTS)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including General and Supplementary Conditions, apply to the Work specified in this Section.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. All other Sections of Division 16.
- B. All other Divisions of the Contract Documents. Refer to each Division's Specifications and Drawings for requirements, including but not limited to the following:
 - 1. Section 16111 - Raceways and Fittings

1.3 SCOPE

- A. Provide all equipment, materials, labor, supervision, and services necessary for or incidental to the installation of conductors as indicated on the Drawings and as specified.
- B. Work included:
 - 1. Wiring connections and terminations, 600 Volt rating and below.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Without additional cost to the Owner, provide such other labor and materials as are required to complete the work of this Section in accordance to the requirements of governmental agencies having jurisdiction, regardless of whether such materials and associated labor are called for elsewhere in these Contract Documents.
- C. When requested, provide the manufacturer's certifications that confirm that materials meet or exceed minimum requirements as specified.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Provide conductors made of soft-drawn annealed copper with a conductivity not less than that of 98% pure copper.
- B. Building Wire:
 - 1. Thermoplastic-insulated building wire: NEMA WC 5.

2. Feeders and branch circuits: Copper, stranded conductor, 600-volt insulation, THHN/THWN-2.
3. Control circuits: Copper, stranded conductor 600-volt insulation, THHN/THWN-2.
4. Use the following color code system:

	208Y/120 Volt Systems (NA)	480/240 Volt Systems
Phase A	Black	Brown
Phase B	Red	Orange
Phase C (NA)	Blue	Yellow
Neutral	White	Gray
Ground	Green	Green

C. Remote Control and Signal Cable:

1. Control cable for Class 2 or Class 3 remote control and signal circuits: Copper conductor, 300-volt insulation, rated 60-degree C, individual conductors twisted together, shielded, and covered with a PVC jacket; UL listed.
2. Plenum cable for Class 2 or Class 3 remote control and signal circuits: Copper conductor, 300-volt insulation, rated 60-degree C, individual conductors twisted together, shielded, and covered with a nonmetallic jacket; UL listed for use in air handling ducts, hollow spaces used as ducts, and plenums.

2.2 ACCEPTABLE MANUFACTURERS

A. Provide products by the following manufacturers:

1. Rome
2. Cablec
3. Pirelli
4. Belden
5. Or approved equal

PART 3 - EXECUTION

3.1 GENERAL WIRING METHODS (LESS THAN 600 VOLTS)

- A. The minimum wire size shall be 12 AWG for power and lighting circuits, and no smaller than 18 AWG for control wiring. Remote control wiring shall not be less than 14 AWG for installed lengths of 50 feet or less. Remote control conductors shall be increased one size (per NEC Table 310) for each additional 50 feet of length. Increase the raceway system to accommodate the increased wire size.
- B. Provide an equal number of conductors of equal size for each phase of a circuit in same raceway or cable.
- C. Splice only in junction boxes, outlet boxes, pullboxes, or manholes.

- D. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- E. Make conductor lengths for parallel circuits equal.

3.2 WIRING INSTALLATION IN RACEWAYS

- A. Pull all conductors into a raceway at the same time. Use UL listed wire-pulling lubricant for pulling 4 AWG and larger wires.
- B. Install wire in raceway after interior of building has been physically protected from the weather and all mechanical work likely to injure conductors has been completed.
- C. Completely and thoroughly swab raceway system before installing conductors.

3.3 WIRING CONNECTIONS AND TERMINATIONS

- A. Splice only in accessible boxes or manholes.
- B. Use solderless pressure connectors with insulating covers for copper wire splices and taps 8 AWG and smaller.
- C. Use split bolt connectors for copper wire splices and taps 6 AWG and larger. Tape uninsulated conductors and connectors with electrical tape to 150 percent of the insulation value of conductor.
- D. Thoroughly clean wires before installing lugs and connectors.
- E. Make splices, taps and terminations to carry full capacity of conductors without perceptible temperature rise.
- F. Terminate spare conductors with electrical tape.

3.4 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under applicable provisions of Division 16.
- B. Inspect wire and cable for physical damage and proper connection.
- C. Torque test conductor connections and terminations to manufacturer's recommended values.
- D. Perform continuity tests on all power and equipment branch circuit conductors. Verify proper phasing of all connections.

3.5 WIRE AND CABLE INSTALLATION SCHEDULE

- A. All locations: Building wire in raceways.

END OF SECTION 16120

SECTION 16135

PRECAST ELECTRICAL MANHOLES AND PULLBOXES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including General and Supplementary Conditions, apply to the Work specified in this Section.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. All other Sections of Division 16.
- B. All other Divisions of the Contract Documents. Refer to each Division's Specifications and Drawings for requirements including the following:
 - 1. Section 16111 – Raceways and Fittings
 - 2. Section 16450 - Grounding

1.3 SCOPE

- A. Provide all equipment, materials, labor, supervision, and services necessary for or incidental to the installation of precast concrete electrical manholes and pullboxes, as indicated on the Drawings and specified.
- B. Work included:
 - 1. Prefabricated Manholes
 - 2. Manhole Accessories
 - 3. Excavation and Backfill as Required

1.4 REFERENCES

- A. AASHO H-20 *Standard Specification for Highway Bridges*
- B. ANSI/ASTM A153 – *Zinc Coating (Hot-Dip) on Iron and Steel Hardware*
- C. ANSI/ASTM A569 – *Steel, Sheet and Strip, Carbon (0.15 Maximum Percent), Hot-Rolled, Commercial Quality*
- D. ASTM A48 – *Gray Iron Castings*
- E. ASTM A124 – *Zinc (Hot-Galvanized) Coatings and Products Fabricated from Rolled, Pressed, And Forged Steel Shapes, Plates, Bars and Strips*

1.5 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workers who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.

- B. Without additional cost, provide such other labor and materials as are required to complete the work of this Section in accordance with the requirements of governmental agencies having jurisdiction, regardless of whether such materials and associated labor are called for elsewhere in the Contract Documents.
- C. Manufacturer: Manufacturer shall be company specializing in structures with three (3) years' documented experience.

1.6 SUBMITTALS

- A. Product Data: Submit the following:
 - 1. Materials list of items proposed to be provided as part of the Work of this section.
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements. Submit shop drawings and product data as follows:
 - a. Materials specifications, dimensions, capacities, sizes and locations of openings, reinforcing details, and accessory locations.
 - b. Product data for manhole accessories.
 - 3. Manufacturer's recommended installation procedures which, when approved, will become the basis for accepting or rejecting actual installation procedures used on the Work. Documentation from the manufacturer, sealed by a professional structural engineer, stating that each manhole or pullbox is properly designed and constructed to meet all requirements of the intended location shall be required.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Strongwell/Quazite
- B. Approved equal

PART 3 - EXECUTION

3.1 PREPARATION

- A. Excavate, install base material, and compact base material in accordance with manufacturer's instructions.

3.2 INSTALLATION – PRECAST MANHOLES

- A. Install and seal precast sections in accordance with manufacturer's instructions.
- B. Install plumb.
- C. Set the top of each pullbox to finished elevation.

3.3 INSTALLATION – ACCESSORIES

- A. Install ground rod with top protruding 4 inches (100 mm) above manhole floor.

3.4 COORDINATION OF BOX LOCATIONS

- A. Provide pullboxes as shown on Drawings and as required for splices, taps, wire pulling, equipment connections and code compliance.
- B. Locations shown on Drawings are approximate unless dimensioned.

END OF SECTION 16135

SECTION 16410

UNDERGROUND ELECTRIC DISTRIBUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including General and Supplementary Conditions, apply to the Work specified in this section.
- B. Refer to Section 16402 for work relating to utility electric service.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. All other Sections of Division 16.
- B. All other Divisions of the Contract Documents. Refer to each Division's Specifications and Drawings for requirements, including but not limited to the following:
 - 1. Section 16010 - General Requirements for Electrical Work
 - 2. Section 16111 - Raceways and Fittings
 - 3. Section 16120 - Wire and Cable (600Volts)

1.3 SCOPE

- A. Provide and install materials, labor, supervision and services necessary for or incidental to the installation of a complete underground electric service as shown or indicated on the drawings and/or as specified.
- B. Work Included:
 - 1. Conduit
 - 2. Conductors
 - 3. Excavation
 - 4. Pull Boxes

1.4 QUALITY ASSURANCE

- A. When requested, provide the manufacturer's certificates that confirm that materials meet or exceed minimum requirements as specified.
- B. Perform cable pulling calculations for the electrical power and communications systems based on the actual field routing of underground conduit or duct prior to duct or conduit installation. Calculations shall demonstrate that cable pulling tensions and sidewall pressures do not exceed manufacturer's requirements.
- C. Submit calculations to the Engineer for approval. Provide pullboxes as required at no additional cost and where required in locations dictated by the calculations.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- A. Conduit: See Section 16111.
- B. Markers: Continuous-printed plastic tape: Reference Section 16195.
- C. Conductors: See Section 16120.
- D. Duct Spacers: Fabricated plastic, UL approved.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Slope service to drainage point.
- B. Terminate conduit in panel with grounding bushing. Make ground connection from bushing to ground bus with ground conductor sized as per drawings.

3.2 CONDUIT

- A. Adjust final slopes on site to coordinate with existing utilities.
- B. Install on undisturbed soil where possible. Use gravel and sand, placed in 8-inch lifts and compacted for backfill.
- C. Clean and swab ducts/conduits.

END OF SECTION 16410

SECTION 16450

GROUNDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The general provisions of the Contract, including General and Supplementary Conditions, apply to the work specified in this Section.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. All other Sections of Division 16.
- B. All other Divisions of the Contract Documents. Refer to each Division's specifications and drawings for all requirements, including but not limited to the following:
 - 1. Section 16111 - Raceways and Fittings.
 - 2. Section 16120 - Wire and Cable.

1.3 SCOPE

- A. Provide all equipment, materials, labor, supervision, and services necessary for or incidental to the installation of electrical systems grounding as shown or indicated on the Drawings and/or as specified.
- B. Work Included:
 - 1. Electrical equipment and raceway grounding and bonding.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Without additional cost to the Owner, provide such other labor and materials as are required to complete the work of this Section in accordance with the requirements of governmental agencies having jurisdiction, regardless of whether such materials and associated labor are called for elsewhere in these Contract Documents.
- C. When requested, provide the Engineer with the manufacturer's certificate that materials meet or exceed minimum requirements as specified.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Provide electrical grounding system indicated with assembly of materials, including but not limited to:
 - 1. Wires and cables.
 - 2. Connectors.
 - 3. Terminals.
 - 4. Ground rods.
 - 5. Bonding jumper braid.
- B. Where materials or components are not indicated, provide products complying with NEC, UL, IEEE, and established industry standards for applications indicated.

2.2 GROUND ROD

- A. Ground Wire Termination: Exothermic connection to 4/0 conductor. U-bolt with pressure plate provided as test point.
- B. Ground Rods: Copper-clad steel, 3/4" diameter, minimum length 8 feet.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install electrical grounding systems in accordance with applicable portions of NEC, with NECA's "Standard of Installation," and in accordance with recognized industry practices to ensure that products comply with requirements and serve intended functions.
- B. Provide a separate, insulated equipment grounding conductor in feeder circuits. Terminate each end on a grounding lug, bus, or bushing.

3.2 FIELD QUALITY CONTROL

- A. Inspect grounding and bonding system conductors and connections for tightness and proper installation.
- B. Electrical Tests:
 - 1. Perform fall-of-potential test or alternative in accordance with IEEE Standard 81-1991 on the main grounding electrode or systems.
 - 2. Perform point-to-point tests to determine the resistance between the main grounding system and all major electrical equipment frames, system neutral, and/or derived neutral points.
- C. Test Values:

1. The resistance between the main grounding electrode and ground should be no greater than five ohms. Install additional grounding electrodes, as required, to achieve the specified resistance value.
 2. Investigate point-to-point resistance values which exceed 0.5 ohm. Correct deficiencies at no additional cost. Retest to prove compliance
- D. Provide written certification to the Engineer that the grounding system has been tested and complies with the specified requirements.
- E. Provide test report.

END OF SECTION 16450

SECTION 16503

POLES AND STANDARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including General and Supplementary Conditions, apply to the Work specified in this Section.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. All other Sections of Division 16.
- B. All other Divisions of the Contract Documents. Refer to each Division's Specifications and Drawings for requirements, including but not limited to the following:
 - 1. Section 16120 - Wires and Cables
 - 2. Section 16450 - Grounding
 - 3. Section 16530 - Site Lighting

1.3 SCOPE

- A. Provide all equipment, materials, labor, supervision, and services necessary for or incidental to the installation of poles and standards as shown or indicated on the Drawings and/or as specified.
- B. Work Included:
 - 1. Concrete bases and base reinforcement.
 - 2. Anchor bolts.

1.4 SUBMITTALS

- A. Reference Section 16010 for detailed requirements.

1.5 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Without additional cost to the Owner, provide such other labor and materials as are required to complete the work of this Section in accordance to the requirements of governmental agencies having jurisdiction, regardless of whether such materials and associated labor are called for elsewhere in these Contract Documents.
- C. When requested, provide the Architect with manufacturer's certificate that materials meet or exceed minimum requirements as specified.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Provide poles and standards as specified on the lighting fixture schedule or an approved equal.

2.2 POLES

- A. Provide poles as specified on the lighting fixture schedule or an approved equal.
- B. Handhole: Complete with removable weatherproof cover installed 18 inches above bottom of pole.
- C. Finish: Factory painted, color selection by architect.

2.3 ANCHOR BOLTS

- A. Provide anchor bolts as recommended by manufacturer. All items to be hot-dipped galvanized.
- B. Provide template for positioning of anchor bolts.
- C. Provide anchor bolt covers painted to match pole.

PART 3 - EXECUTION

3.1 BASES

- A. Construct as indicated on the civil drawings.
- B. Install anchor bolts with 2 inch projection above top of bases unless indicated otherwise on the contract drawings.

3.2 INSTALLATION

- A. Mount standards on bases plumb and true, utilizing shims as necessary.
- B. Touch-up chips and scratches on poles upon completion.

END OF SECTION 16503

SECTION 16530

SITE LIGHTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including General and Supplementary Conditions, apply to the Work specified in this Section.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. All other Sections of Division 16.
- B. All other Divisions of the Contract Documents. Refer to each Division's Specifications and Drawings for requirements, including but not limited to the following:
 - 1. Section 16111 - Conduit.
 - 2. Section 16503 - Poles and Standards.

1.3 SCOPE

- A. Provide all equipment, materials, labor, supervision, and services necessary for or incidental to the installation of site lighting as shown or indicated on the Drawings and/or as specified.
- B. Work Included:
 - 1. Exterior lighting fixtures.

1.4 QUALITY ASSURANCE

- A. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- B. Without additional cost to the Owner, provide such other labor and materials as are required to complete the work of this Section in accordance to the requirements of governmental agencies having jurisdiction, regardless of whether such materials and associated labor are called for elsewhere in these Contract Documents.
- C. When requested, provide the Architect with manufacturer's certificate that materials meet or exceed minimum requirements as specified.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Provide exterior lighting fixtures of the types specified on the Drawings.

2.2 EXTERIOR LUMINAIRES AND ACCESSORIES

- A. Enclosures: Complete with gaskets, stops, and barriers to form weatherproof assembly and prevent light leaks.
- B. Provide low temperature ballasts, with reliable starting to -20 degrees F.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install underground wiring in conduit with watertight connections. Refer to Section 16111.

END OF SECTION 16530



U.S. Department
of Transportation
Federal Aviation
Administration

Advisory Circular

Subject: SPECIFICATION FOR OBSTRUCTION LIGHTING EQUIPMENT **Date:** 09/12/06 **AC No.:** 150/5345-43F
Initiated by: AAS-100 **Change:**

1. **PURPOSE.** This advisory circular (AC) contains the Federal Aviation Administration (FAA) specification for obstruction lighting equipment.
2. **EFFECTIVE DATE.** Effective 6 months after the date of this circular, only that equipment qualified per this specification will be listed in AC 150/5345-53, Airport Lighting Equipment Certification Program.
3. **CANCELLATION.** AC 150/5345-43E, *Specification for Obstruction Lighting Equipment*, dated October 19, 1995, is canceled.
4. **APPLICATION.** The specifications contained in this AC are recommended by the FAA in all applications involving development of this nature. For airport projects receiving Federal funds under the airport grant assistance program, the use of these standards is mandatory.
5. **DEFINITIONS.**
 - a. **Beam Spread.** The angle between the two directions in a plane for which the intensity is equal to 50 percent of the minimum specified peak beam effective intensity.
 - b. **Vertical Aiming Angle.** The angle between the horizontal and a straight line intersecting the beam at its maximum intensity.
 - c. **Steady-Burning (fixed) Light.** A light having constant luminous intensity when observed from a fixed point.
 - d. **Effective Intensity.** The effective intensity of a flashing light is equal to the intensity of a steady-burning (fixed) light of the same color that produces the same visual range under identical conditions of observation.
6. **PRINCIPAL CHANGES.**
 - a. Added a requirement for the use of ultraviolet and ozone resistant materials with xenon flashtubes.
 - b. Added a requirement for solar radiation resistant plastic parts and applicable testing.
 - c. Added a requirement for surge protection and testing for equipment with solid-state devices.

d. Added requirements from FAA Engineering Brief #67 as necessary to provide requirements for obstruction lighting using alternative light sources (ALDs).

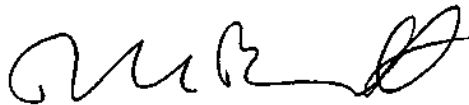
e. Added optional radiated emissions requirements with no testing required.

7. **METRIC UNITS.** To promote an orderly transition to metric units, this AC includes both English and metric dimensions. The metric conversions may not be exact equivalents, and until there is an official changeover to the metric system, the English dimensions will govern.

8. **COMMENTS OR SUGGESTIONS** for improvements to this AC should be sent to:

Manager, Airport Engineering Division
Federal Aviation Administration
ATTN: AAS-100
800 Independence Avenue, S.W.
Washington, DC 20591

9. **COPIES OF THIS AC.** The Office of Airport Safety and Standards makes this AC available online at www.faa.gov.



DAVID L. BENNETT
Director of Airport Safety and Standards

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CHAPTER 1. SCOPE AND CLASSIFICATION.**1.1 Scope.**

This specification sets forth the Federal Aviation Administration (FAA) requirements for obstruction lighting equipment used to increase conspicuity of structures to permit early obstruction recognition by pilots.

1.2 Equipment Classification.

Type	Description
L-810	Steady-burning red obstruction light
L-856	High intensity flashing white obstruction light, 40 Flashes Per Minute (FPM)
L-857	High intensity flashing white obstruction light, 60 FPM
L-864	Flashing red obstruction light, 20-40 FPM
L-865	Medium intensity flashing white obstruction light, 40 FPM
L-866	Medium intensity flashing white obstruction light, 60 FPM
L-885	Flashing red obstruction light, 60 FPM

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CHAPTER 2. REFERENCED DOCUMENTS.

2.1 General.

The following is a listing of documents referenced in this AC.

2.2 FAA Advisory Circulars (ACs).

AC 70/7460-1	<i>Obstruction Marking and Lighting</i>
AC 150/5345-53	<i>Airport Lighting Equipment Certification Program</i>

2.3 FAA Engineering Briefs.

Engineering Brief #67	<i>Light Sources Other Than Incandescent and Xenon for Airport and Obstruction Lighting Fixtures</i>
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2.4 Military Standards and Specifications.

MIL-STD-810F	<i>Environmental Engineering Considerations and Laboratory Tests</i>
MIL-C-7989	<i>Cover, Light-Transmitting, for Aeronautical Lights, General Specification for</i>

2.5 Code of Federal Regulations (CFR).

Title 47	<i>Telecommunications</i>
Part 15	<i>Radio Frequency Devices</i>

2.6 Institute of Electrical and Electronics Engineers (IEEE) Publications.

IEEE C62.41-1991	<i>IEEE Recommended Practice on Surge Voltages in Low-Voltage AC Power Circuits</i>
IEEE C62.45	<i>IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000 V and Less) AC Power Circuits</i>

2.7 International Standardization Organization (ISO) Publications.

ISO-10012	<i>Measurement Management Systems – Requirements for Measurement Processes and Measuring Equipment</i>
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2.8 International Civil Aviation Organization (ICAO).

Annex 14	<i>Volume 1, Aerodrome Design and Operations</i>
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2.9 Illuminating Engineering Society (IES).

IES Handbook	<i>Reference and Application Volume, 8th Edition, 1993, Flashing Light Signals, pp. 96-97</i>
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Copies of FAA ACs may be obtained from:

U.S. Department of Transportation
Subsequent Distribution
Office Ardmore East Business Center
3341 Q 75th Ave.
Landover, MD 20785

Tel: (301) 322-4961
FAX: (301) 386-5394
Website: www.faa.gov

Copies of military standards and specifications may be obtained from:

DAPS/DODSSP
Building 4, Section D
700 Robbins Avenue
Philadelphia, PA 19111-5094

Tel: (215) 697-2179
FAX: (215) 697-1460
Website: dodssp.daps.dla.mil

Copies of IEEE standards may be obtained from:

IEEE Customer Service Center
445 Hoes Lane
P.O. Box 1331
Piscataway, NJ 08855-1331

Tel: (800) 678-4333
FAX: (732) 981-0060 (*Worldwide*)
FAX: (732) 981-9667
E-mail: storehelp@ieee.org
Website: shop.ieee.org/ieeestore

Copies of the ISO document are available online from:

Website: www.iso.ch

Copies of ICAO documents may be obtained from:

ICAO, Document Sales Unit
999 University Street
Montreal, Quebec, Canada H3C 5H7

Telephone: +1 (514) 954-8022
FAX: +1(514) 954-6769

E-mail: sales@incao.int
Website: www.icao.int

09/12/06

AC 150/5345-43F

Copies of IES of North America (IESNA) documents may be obtained from:

Website: www.techstreet.com

or

Website: www.iesna.org/shop/

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CHAPTER 3. EQUIPMENT REQUIREMENTS.

3.1 General.

This section addresses environmental, design, and photometric requirements for obstruction light equipment. Criteria for selecting the proper obstruction lighting equipment, installation tolerances, and administrative information are in AC 70/7460-1, *Obstruction Marking and Lighting*.

3.2 Environmental Requirements.

Obstruction lighting equipment must be designed for continuous operation under the following conditions:

- a. Temperature. Storage/shipping: -67 degrees Fahrenheit (F) (-55 degrees Celsius (C)) to 130 degrees F (55 degrees C). Operating: -40 degrees F (-40 degrees C) to 130 degrees F (55 degrees C).
- b. Humidity. 95 percent relative humidity.
- c. Wind. Wind speeds up to 150 miles per hour (mph) (240 kilometers per hour (kmph)).
- d. Wind-blown Rain. Exposure to wind-blown rain from any direction.
- e. Salt Fog. Exposure to salt-laden atmosphere.
- f. Sunshine. Exposure to solar radiation.

3.3 Design Requirements.

3.3.1 Light Unit.

The light unit must be lightweight and designed for easy servicing and lamp (or flashtube) replacement. Materials used within the light unit must be selected for compatibility with their environment. All plastic lens parts (including gaskets), that are exposed to ultraviolet radiation or ozone gas must not change color, crack, check, disintegrate, or be otherwise degraded (photometry must remain compliant) and meet the equipment warranty requirements of AC 150/5345-53, Appendix 2. Each light unit must be an independent unit and must flash at the specified intensity or at its highest intensity when control signals are absent.

3.3.2 Light Covers.

Light-transmitting covers for light units must be per the requirements in MIL-C-7989. In addition, if plastic covers are used, they must be resistant to checking, crazing, or color changes caused by ultraviolet radiation or ozone gas exposure.

3.3.3 Light Colors.

The aviation red must be per ICAO Annex 14, Volume 1, Appendix 1, *Colours for Aeronautical Ground Lights*, at operating temperature within the following chromaticity boundaries:

$$\text{purple boundary} \quad y = 0,980 - x$$

yellow boundary $y = 0.335$
 $x + y + z = 1$

Xenon flashtube emission or a color temperature range from 4,000 to 8,000 degrees Kelvin is acceptable for white obstruction lights. See Engineering Brief #67 for additional information about lamp chromaticity requirements.

3.3.3.1 Light Color During Daytime.

Means must be provided on all L-810 obstruction lights to indicate the specified non-powered color during daytime viewing. See Engineering Brief #67 for additional information.

3.3.4 Aiming (for L-856 and L-857).

Light units must have a method for adjustment of the vertical aiming angle between 0 and +8 degrees. A spirit level or other device must be provided as part of each light unit for setting the vertical aiming angle of the light beam with an accuracy of one degree.

3.3.5 Control Unit.

3.3.5.1 Flashing White Obstruction Lighting Systems.

The control unit must set the system's flash rate, intensity and sequence and must be capable of controlling light units up to a distance of 2,500 feet (ft) (762 meters (m)). If the control unit or control wiring fails, the light units must continue to flash per Table 4 flash rate. Failure of an intensity step change circuit must cause all light units to remain operating at their proper intensity or alternatively to operate at the high intensity step.

3.3.5.1.1 Monitoring.

Each light unit must be monitored for FLASH/FAIL status. FAIL status is defined as either of the following conditions: unit misses four or more consecutive flashes; unit flashes at wrong intensity step during day operation. Monitoring must be fail safe (i.e., active signals for FLASH and absence of signals for FAIL). There must be a provision to permit connection to a remote alarm device, (supplied by others or as an option), to indicate the system and individual light unit FLASH/FAIL status.

NOTE: See Engineering Brief #67 for additional information regarding the failure requirements for multiple alternative lighting devices (ALDs).

3.3.5.1.2 Placement.

The control and monitor functions may be consolidated in a light unit or in a single enclosure for remote mounting or they may be distributed into several light units.

3.3.5.1.2.1 Remote Mounting.

In addition to the above, if placed in a remote mounted enclosure, the control unit must display the status of each light unit. An intensity control override switch must also be mounted in the enclosure to manually control light intensity during maintenance or in the event of a photoelectric control malfunction.

3.3.5.2 Flashing Red Obstruction Lights.

The control unit must set the system flash rate and flash sequence. Failure of the flashing circuit must cause the light units to energize and operate as steady burning lights. An override switch must be mounted on the control unit to manually control the lights during maintenance or in the event of a lack of a photoelectric control signal. To insure proper operation, all flashing red obstruction lights, inclusive of any associated system steady burning red lights, must be certified with a control unit whether internal or external to the lighting unit.

3.3.5.2.1 Dual Lighting Systems.

The control unit may be a separate unit or incorporated as part of either the white or red obstruction light control unit. The control unit must set the operating mode for each light unit in the system. Outage of one of two lamps, or any failure in the device that causes a reduction in intensity of the horizontal beam or results in an outage in the uppermost red beacon (L-864 unit) or outage of any uppermost red strobe, must cause the white obstruction light system to operate in its specified "night" step intensity. At no time should both red and white systems be on simultaneously. An override switch must be mounted on the control unit to manually control the operating mode of the system during maintenance or in the event of a lack of a photoelectric control signal.

3.3.5.2.2 Monitoring.

Each separate L-864 light unit and each tier of L-810 light units must be monitored for FLASH/FAIL status. FAIL is defined as outage of any lamp in an L-864 light unit, outage of any one lamp in a tier of L-810 light units, or failure of a flasher (steady on and/or total) for an L-864 light unit. Monitor signals must be fail safe (i.e., active signals for FLASH and absence of signals for FAIL). There must be a provision to permit connection to a remote alarm device, (supplied by others or as an option) to indicate FLASH/FAIL status.

NOTE: See Engineering Brief #67 for additional information regarding the failure requirements for multiple alternative lighting devices (ALDs).

3.3.6 Input Voltage.

The obstruction lighting equipment must be designed to operate from the specified input voltage ± 10 percent. Incandescent lamps must be operated to within ± 3 percent of the rated lamp voltage to provide proper light output.

3.3.7 Performance Criteria.

Manufacturers are required to publish performance criteria for all light generating devices (see Engineering Brief #67).

3.3.8 Transient Protection.

Equipment with solid state devices must be designed to withstand and/or include separate surge protection devices that are tested against defined waveforms per IEEE C62.41-1991, Table 4, Location Category C1, for single phase modes (line to ground, line to neutral, line and neutral to ground).

3.3.9 Radiated Emissions.

NOTE: *Optional only. No equipment qualification is required.*

a. Obstruction lighting that uses electronic circuitry to power the light source must be classified as an incidental radiator (47 CFR §15.13). This applies to equipment that does not intentionally generate any radio frequency energy, but may create such energy as an incidental part of its intended operations.

b. Obstruction light systems must employ sound engineering practices to minimize the risk of harmful interference.

3.3.10 Warning Labels.

All enclosures that contain voltages exceeding 150 volts direct current (VDC) or alternating current (AC) root mean square (rms) must have high voltage warning label(s) placed at a conspicuous location(s). Also, a visual indicator must be included within the enclosure to indicate that greater than 150 VDC is present on the high voltage capacitors.

3.3.11 Interlock Switches.

Interlock switches must be incorporated in each power supply and optionally in each flashhead so that opening either unit must (1) interrupt incoming power and (2) discharge all high voltage capacitors within the enclosure to 50 volts or less within 30 seconds.

3.3.12 Nameplate.

A nameplate, with the following information, must be permanently attached to each unit:

- a. Name of unit (light unit, control unit, etc.).
- b. FAA type (e.g., L-856, L-864, etc.).
- c. Manufacturer's catalog number.
- d. Manufacturer's name and address.
- e. Rated separation distance in feet is ____ to ____ between power supply and optical head using American Wire Gage (AWG) ____ conductors. (Item e is required if a unique power supply and its associated optical head are separate components of the lighting system as in the case of some discharge lights.)

In addition to the above, the power supply must include nominal input voltage, number of phases, frequency, and peak VA rating.

3.3.13 Optional Arctic Kit

Light systems may be offered with an optional arctic kit to enable operation in temperatures below -40 degrees F (-40 degrees C).

3.3.14 Component Ratings.

3.3.14.1 Discharge Type Lighting Equipment.

The flashtube or flashtubes must have a minimum rated life of two years without maintenance or loss of light output below the minimum specified candela.

3.3.14.2 Component Separation Rating.

If the light unit's power supply and optical head are separate components, the manufacturer must rate each light unit for maximum and minimum separation at a given AWG wire size. The manufacturer must include this rating on the nameplate per section 3.3.12. The rating certifies that the unit meets all requirements within the rated distances. The manufacturer must maintain records of test results which support the stated separation rating until the next system re-qualification.

3.3.14.3 Incandescent Light Equipment.

Lamps must have a minimum rated life of 2,000 hours at rated voltage.

3.3.14.4 Alternative Light Source Equipment.

Light sources other than incandescent or xenon (light emitting diodes, cold cathode) must have a minimum rated life of two years without maintenance or loss of light output below the minimum specified intensity (see Engineering Brief #67).

3.3.14.5 Light Equipment Components.

All components used in obstruction lighting equipment, except lamps, must be designed to meet performance requirements for a minimum of one year without maintenance.

3.3.15 Leakage Current.

All obstruction lighting equipment classified in paragraph 1.2 must be designed to withstand application of 1,000 volts AC or 1,414 volts DC between the input power leads and equipment chassis for 10 seconds during which the leakage current must not exceed 10 microamperes at ambient room temperature and humidity.

3.4 Performance Requirements.

3.4.1 Photometric.

3.4.1.1 General.

The effective intensity for flashing lights must be calculated per the following formula by the method described for *Flashing Light Signals* in the IES Handbook, 1993 Reference and Application Volume 8th Edition, Pages 96 and 97:

$$I_e = \left(\int_{t_1}^{t_2} I dt \right) / (0.2 + (t_2 - t_1))$$

Where:

- I_e = Effective intensity (Candela)
 I = Instantaneous intensity (Candela)
 t_1, t_2 = Times in seconds of the beginning and end of that part of the flash when the value of I exceeds I_e . This choice of the times maximizes the value of I_e .

For discharge type flashing lights, the equipment must provide the specified light output at the specified temperature extremes as the input voltage simultaneously varies by ± 10 percent from nominal. The light intensity and beam distribution requirements for obstruction lighting equipment are specified below. All intensities listed are effective intensities (except steady-burning red obstruction lights) measured at the flash rate specified in Table 4. All incandescent lights will be tested as steady burning lights. Additional requirements for ALDs are in Engineering Brief #67.

The effective intensity for multiple pulse flashes as used in strobe lights during nighttime operation must be calculated by:

$$I_e = \left(\frac{\int_{t_1}^{t_A} I dt}{0.2 + t_A - t_1} \right) + \left(\frac{\int_{t_B}^{t_C} I dt}{0.2 + t_C - t_B} \right) + \left(\frac{\int_{t_D}^{t_E} I dt}{0.2 + t_E - t_D} \right) + \dots + \left(\frac{\int_{t_X}^{t_Z} I dt}{0.2 + t_Z - t_X} \right)$$

The frequency of the pulses must not be less than 50 Hz and the interval $t_A - t_1$ must not vary by more than $\pm 5\%$ from the nominal value from pulse to pulse over the simultaneous extremes of temperature and input voltage.

3.4.1.2 L-810 Light Unit.

The center of the vertical beam spread must be between +4 and +20 degrees. With a minimum vertical beam spread of 10 degrees and at all radials throughout 360 degrees, there must be a minimum intensity of 32.5 candela. Mechanical interface for installation must be 3/4 or 1 inch National Pipe Thread (NPT) side and/or bottom.

3.4.1.3 L-856 Light Unit.

The beam spread and effective intensity must be per Table 1.

Table 1. L-856 Intensity Requirements.

Step	Beam Spread		Peak Intensity (candela) ⁽²⁾
	Horizontal ⁽¹⁾ (degrees)	Vertical (degrees)	
Day	90 or 120	3 - 7	270,000 ±25%
Twilight	90 or 120	3 - 7	20,000 ±25%
Night	90 or 120	3 - 7	2,000 ±25%

NOTES:

- (1) Multiple light units may be used to achieve a horizontal coverage of 360 degrees.
- (2) When the light unit is installed per the manufacturer's instructions, the intensity at zero degrees elevation angle (horizontal) must be at least as great as the minimum specified beam peak intensity. For stray light, the intensity at 10 degrees below horizontal, at any radial, must not be greater than 3% of the peak intensity at the same radial.

3.4.1.4 L-857 Light Unit.

Photometric requirements are defined in Table 2.

Table 2. L-857 Intensity Requirements.

Step	Beam Spread		Peak Intensity (candela) ⁽²⁾
	Horizontal ⁽¹⁾ (degrees)	Vertical (degrees)	
Day	90 or 120	3 - 7	140,000 ±25%
Twilight	90 or 120	3 - 7	20,000 ±25%
Night	90 or 120	3 - 7	2,000 ±25%

NOTES:

- (1) Multiple light units may be used to achieve a horizontal coverage of 360 degrees.
- (2) When the light unit is installed per the manufacturer's instructions, the intensity at zero degrees elevation angle (horizontal) must be at least as great as the minimum specified beam peak intensity. For stray light, the intensity at 10 degrees below horizontal, at any radial, must not be greater than 3% of the peak intensity at the same radial.

3.4.1.5 L-864 Light Unit.

At all radials throughout the omnidirectional 360 degrees, there must be a peak effective intensity of 2,000 ±25 percent candela. There must also be a minimum effective intensity of 750 candela throughout a minimum vertical beam spread of 3 degrees.

3.4.1.5.1 Beam Adjustment.

When the light unit is installed per the manufacturer's instructions, the intensity at zero degrees elevation angle (horizontal) must be at least as great as the minimum specified beam peak intensity.

3.4.1.6 L-865 Light Unit.

Photometric requirements are defined in Table 3.

Table 3. L-865 Intensity Requirements.

Step	Beam Spread		Peak Intensity (candela) ⁽²⁾
	Horizontal (degrees) ⁽¹⁾	Vertical (degrees)	
Day/Twilight	360	3 minimum	20,000 ±25%
Night	360	3 minimum	2,000 ±25%

NOTES:

- (1) Multiple light units may be used to achieve a horizontal coverage of 360 degrees.
- (2) When the light unit is installed per the manufacturer's instructions, the intensity at zero degrees elevation angle (horizontal) must be at least as great as the minimum specified beam peak intensity. For stray light, the intensity at 10 degrees below horizontal, at any radial, must not be greater than 3% of the peak intensity at the same radial.

3.4.1.7 L-866 Light Unit.

The requirements are the same as the L-865 light unit, except the flash rate must be 60 flashes per minute (FPM).

3.4.1.8 L-885 Light Unit.

The requirements are the same as the L-864 light unit, except the flash rate must be 60 FPM.

3.4.2 Flash Rate and Duration.

Flash characteristics are defined in Table 4.

Table 4. Flash Characteristics for Obstruction Lights

Type	Intensity Step	Flash Rate ⁽¹⁾	Flash Duration ⁽²⁾
L-856	Day & Twilight	40 FPM	Less than 100 milliseconds (ms)
L-856	Night	40 FPM	Between 100 and 250 ms inclusive
L-857	Day & Twilight	60 FPM	Less than 100 ms
L-857	Night	60 FPM	Between 100 and 250 ms inclusive
L-864	Single	20-40 FPM	1/2 to 2/3 of flash period if incandescent lighting ⁽³⁾ , and between 100 and 2000 ms inclusive if other lighting sources.
L-865	Day & Twilight	40 FPM	Less than 100 ms
L-865	Night	40 FPM	Between 100 and 1000 ms inclusive
L-866	Day & Twilight	60 FPM	Less than 100 ms
L-866	Night	60-FPM	Between 100 and 250 ms inclusive
L-885	Single	60 FPM	1/2 to 2/3 of flash period if incandescent lighting ⁽³⁾ , and between 100 and 670 ms inclusive if other lighting sources.

NOTES:

- (1) Flash rates have a tolerance of ± 5 percent.
- (2) When the effective flash duration is achieved by a group of short flashes, the short flashes must be emitted at a rate of not less than 50 Hz.
- (3) The light intensity during the "off" period must be less than 10 percent of the peak effective intensity. The "off" period must be at least 1/3 of the flash period.

3.4.3 System Flashing Requirements.**3.4.3.1 Simultaneous Flashing Systems.**

All obstruction lights in systems composed of either L-864 light units or L-856 and/or L-865 light units must flash within 1/60 of a second of each other.

3.4.3.2 Sequenced Flashing Systems.

a. Catenary support structure systems composed of L-857, L-866, or L-885 light units must have a sequenced flashing characteristic.

b. This system consists of three lighting levels on or near each supporting structure. One light level is near the top, one at the bottom or lowest point of the catenary, and one midway between the top and bottom.

- c. The flash sequence must be middle, top, and bottom.
- d. The interval between top and bottom flashes must be about twice the interval between middle and top flashes.
- e. The interval between the end of one sequence and the beginning of the next must be about 10 times the interval between middle and top flashes.
- f. The time for the completion of one cycle must be one second (± 5 percent).

3.4.4 Intensity Step Changing.

3.4.4.1 White Obstruction Lights.

The light unit intensity must be controlled by a photocell facing the northern (polar) sky. White obstruction lights must automatically change intensity steps when the ambient light changes as follows:

- a. From day intensity to twilight intensity when the illumination decreases below 60 foot-candles (645.8 lux) but before it reaches 35 foot-candles (376.7 lux).
- b. From twilight intensity to night intensity when the illumination decreases below 5 foot-candles (53.8 lux) but before it reaches 2 foot-candles (21.5 lux).
- c. From night intensity to twilight intensity when the illumination increases above 2 foot-candles (21.5 lux) but before it reaches 5 foot-candles (53.8 lux).
- d. From twilight intensity to day intensity when the illumination increases above 35 foot-candles (376.7 lux) but before it reaches 60 foot-candles (645.8 lux).

3.4.4.2 Red Obstruction Lights.

If automatic control is utilized, the light unit must turn on when the ambient light decreases to not less than 35 foot-candles (367.7 lux) and turn off when the ambient light increases to not more than 60 foot-candles (645.8 lux). Single L-810 light units are controlled in a manner compatible with the particular installation.

3.4.4.3 Dual Obstruction Lighting System.

White obstruction lights must turn off and red obstruction lights must turn on when the ambient light changes from twilight to night per paragraph 3.4.4.1b. Red obstruction lights must turn off and white obstruction lights must turn on when the ambient light changes from night to twilight per paragraph 3.4.4.1c.

3.5 Instruction Manual.

An instruction manual containing the following information must be furnished with all obstruction lighting equipment:

- a. Complete system schematic and wiring diagrams showing all components cross-indexed to the parts list.

- b. Complete parts list of field replaceable parts with applicable rating and characteristics of each part, and with the component manufacturer's part number as appropriate.
- c. Installation instructions, including leveling and aiming of light units.
- d. Maintenance instructions, including lamp or flashtube replacement, theory of operation, troubleshooting charts and, as appropriate, conspicuous warnings about alignment and replacement of lamps and light units with other than manufacturer recommended items. Explanation of testing requirements regarding light units with specific lamps must be provided in the text. A discussion must be included about mixing light units as replacements with other manufacturers' units with emphasis on assuring that system design of obstruction lighting is not degraded.
- e. Operating instructions.

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CHAPTER 4. EQUIPMENT QUALIFICATION REQUIREMENTS.

4.1 Qualification Procedures.

Procedures for qualifying equipment to be furnished under the Federal grant assistance program for airports are contained in AC 150/5345-53, *Airport Lighting Equipment Certification Program*.

4.2 Qualification Tests.

Qualification tests must be conducted on the light unit in the following order:

- a. Initial photometric test, per paragraph 4.2.1
- b. Environmental tests, per paragraphs 4.2.2, 4.2.3, 4.2.4, 4.2.5, 4.2.6, 4.2.7, and 4.2.8 (in any order)
- c. 1000 hours of continuous operation, per paragraph 4.2.10
- d. System Operational Test, per paragraph 4.2.10
- e. Leakage Current Test, per paragraph 4.2.11
- f. Sampling Photometric Test, per paragraph 4.2.1
- g. Visual examination, per paragraph 4.2.12
- h. Transient Protection Test, per paragraph 4.2.9. The equipment may be damaged by this test. It should only be performed when testing per paragraphs a through c above is complete.

Sample photometric and system operational tests must be conducted after completion of all environmental tests. The same unit(s) must be used throughout the tests. The following tests are required to demonstrate compliance with this specification. The tests may be run on the control unit, power supply, and a single light unit, with a simulated load replacing the other light units. Equipment tested must be as a complete system.

4.2.1 Photometric Test.

- a. A full photometric test as described in this section must be performed before all environmental tests.

NOTE: *To verify proper color correction, photometric testing conducted on alternative light source fixtures must be done with a detector having an up to date calibration including spectral response data (see Engineering Brief #67).*

- b. A sampling photometric retest must be conducted after the unit has been operated continuously for 1000 hours with normal (12 hour) day/night cycling. This sampling must consist of measuring the vertical beam pattern for compliance with photometric requirements at a minimum of two of the previously tested horizontal radials.
- c. Light units must be energized by the system power supply and control unit, and must be tested for compliance with photometric requirements.

- d. For alternative light source equipment high temperature testing, see Engineering Brief #67.
- e. Incandescent lamps must be tested at ± 3 percent of their nominal voltage.
- f. Red light intensity may be measured in white light and then calculated if the glassware manufacturer certifies the chromaticity and transmissivity values of the red filter material for the particular source.
- g. If more than one lamp type is to be used, the qualification testing must be completed for each lamp type.
- h. For a discharge type flashing system, if the power supply and optical head are separate components, the manufacturer must demonstrate that the required photometrics are produced with the units separated by maximum and minimum recommended distances and connected by cable recommended by the manufacturer.
- i. Photometric test results must be in the forms of:
 - (1) Vertical beam pattern: Distribution curve (vertical angle versus candela) with minimum one degree spacing of test points over range of specified angles.
 - (2) Horizontal beam pattern: Polar plot (horizontal angle versus candela) with minimum 30 degree spacing of test points.

4.2.2 High Temperature Test.

- a. The high temperature test must be conducted per MIL-STD-810F, Method 501.4, Procedure II. The equipment must be subjected to a constant temperature of +130 degrees F (+55 degrees C) for 4 hours after equipment temperature stabilization and be operated throughout the test.

NOTE: For steady state temperature testing, consider thermal stabilization to be achieved when the temperatures of critical internal operating components are relatively constant. (Because of test item duty cycling or the operating characteristics, a constant temperature may never be achieved.)

- b. During the test, the manufacturer must demonstrate that the equipment maintains the specified flash rate and (for discharge type flashing light) the proper amount of energy is being delivered to the flashtube as the input voltage is varied by ± 10 percent from nominal.
- c. A visual examination must be conducted after the equipment is removed from the chamber. Failure of the equipment to operate as specified is cause for rejection.

4.2.3 Low Temperature Test.

- a. The low temperature test must be conducted per MIL-STD-810F, Method 502.4, Procedure II. The equipment must be placed in a chamber that maintains a temperature of -67 degrees F (-55 degrees C) for shipping/storage requirements and -40 degrees F (-40 degrees C) for equipment operational requirements.
- b. Equipment operation must be demonstrated at the beginning of the test.

c. The equipment storage and shipping low temperature requirement is -67 degrees F (-55 degrees C). The equipment must be stabilized and cold soaked at the storage/shipping temperature for one hour. The test chamber must then be ramped to the -40 degree F (-4 degrees C) equipment operating temperature at no more than 6 degrees F (3 degrees C) per minute to prevent thermal shock to the equipment.

d. The equipment, with input power off, must then be exposed to a 24-hour soaking period at -40 degrees F (-40 degrees C) after which the equipment must be turned on for one hour, and must operate normally. For discharge type flashing lights, the unit must achieve specified flash rate and intensity within 1 minute after being energized. During the one hour of operation, the manufacturer must demonstrate that the equipment maintains the specified flash rate and, for discharge type flashing lights, the proper amount of energy is being delivered to the flashtube as the input voltage is varied by ± 10 percent from nominal.

e. At the conclusion of the test, a visual inspection must be conducted. Failure of the equipment to operate as specified is cause for rejection.

4.2.4 Rain Test.

The wind-blown rain test must be conducted per MIL-STD-810F, Method 506.4, Procedure I, paragraph 4.4.2. The rain must be at a rate of 5.2 inches per hour (132 mm/hour) with an exposure time of 30 minutes per side. The equipment must be operated throughout the test. Failure of the equipment to operate as specified is cause for rejection.

4.2.5 Wind Test.

Evidence must be provided, either by testing or by calculation of mechanical force, to demonstrate that installed light units meet the wind requirement in paragraph 3.2c.

4.2.6 Humidity Test.

The test must be per MIL-STD-810F, Method 507.4, Procedure, paragraph 4.5.2. The equipment must be subjected to two complete cycles per Table 507.4-1, except the maximum chamber temperature must be +130 degrees F (+55 degrees C). Failure of the equipment to operate as specified is cause for rejection.

4.2.7 Salt Fog Test.

The salt fog test must be conducted per MIL-STD-810F, Method 509.4, Procedure, paragraph 4.5.2. Failure of the equipment to operate as specified is cause for rejection. If corrosion is present, the third party certification body must determine if it has impacted equipment structural integrity or functionality.

4.2.8 Sunshine Test.

NOTE: *The manufacturer may submit a certificate of compliance (for consideration by the third party certification body) from the material(s) manufacturer attesting to UV resistance (per MIL-STD-810F) in lieu of the testing requirements below.*

The equipment must be in its normal operational configuration for this test.

- a. A sunshine test must be conducted per MIL-STD-810, Method 505.4, paragraph 4.4.3, Procedure II for all obstruction lighting equipment with nonmetallic exterior parts or plastic/thermoplastic light covers.
- b. The equipment must be subjected to a minimum of 56 cycles.
- c. Perform an operational test of the equipment after 56 cycles.
- d. Any evidence of deterioration of plastic parts: chalking, bleaching, cracking, hazing, or color changes (yellowing) to the thermoplastic lenses of the test unit must be causes for rejection.
- e. For plastic/thermoplastic optical lenses or covers, the photometric performance must be measured after this test.

4.2.9 Transient Protection Test.

NOTE: *The equipment may be damaged by this test. Perform this test only when tests in paragraphs 4.2.1 through 4.2.8 are completed.*

- a. Subject the obstruction lighting equipment to 2 pulses at 15 second intervals to a combination wave 1.2 microseconds (μs)/50 μs and 8 μs /20 μs (6,000 volts, 3,000 amps) test pulse per the descriptions in IEEE C62.41, Table 4, Location Category C1.
- b. See IEEE C62.41-1991 Section 9.3 for test condition and test generator information.
- c. See IEEE C62.41-1991 Section 9.4 for a detailed combination pulse generation and parameters discussion.
- d. See also IEEE C62.45, *IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1,000 volts (V) and Less) AC Power Circuits* for guidance about equipment test methods.
- e. The equipment under test must operate normally at the conclusion of the test.

4.2.10 System Operational Test.

- a. A system operational test must be performed after the unit has been operated continuously without failure for 1000 hours with normal (12 hour) day/night cycling.
- b. System components must be connected with the necessary wiring to electrically simulate an actual installation in which the top and bottom light units on a structure are separated by 2,000 feet (609.6 m) for a system composed of L-856 and/or L-865 and 500 feet (152.4 m) for system composed of L-857 or L-866, and the controller separated an additional 2,500 feet (762.0 m). Simulated interconnecting cables with equivalent impedance may be used in lieu of full cable lengths.
- c. The system must be energized and operated to demonstrate compliance with all specification operating requirements such as flash rate, flash sequence, photoelectric switching of intensity steps, operation of interlocked devices, and satisfactory operation under input voltage variations.

d. If the power supply and optical head are separate components, it must be demonstrated that with the maximum and minimum nameplate rated separation between components, proper energy is delivered to the light unit to produce the specified photometrics.

e. It must be demonstrated that L-810 and L-864 lights produce the specified photometric requirement when energized over conductors (actual or simulated) representing the maximum and minimum nameplate rated cable length at the minimum input voltage.

4.2.11 Leakage Current Test.

Light units must be tested for compliance to the leakage current requirement in paragraph 3.3.15. Leakage current must be measured between the primary power connection points to the equipment chassis. The primary power connection points may be connected together during this test, but all other internal wiring must be connected as in normal operation. Devices for surge and lightning protection connected directly to input power wiring may be disconnected during this test.

4.2.12 Visual Examination.

The obstruction lighting equipment must be examined for compliance with the requirements on materials, finish, and quality of workmanship.

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CHAPTER 5. PRODUCTION TEST REQUIREMENTS.

5.1 System Production Tests.

A visual examination must be performed for all components in a system to verify proper materials and assembly. Each component of the system must be energized and tested to verify specified operation and conformance to photometric requirements.

5.2 Incandescent Light Unit Production Tests.

All light units must be visually examined for proper materials and assembly. The manufacturer must demonstrate that the on-going production photometric test results show the manufacturing process meets the photometric requirements per paragraphs 3.4.1.2, 3.4.1.5, or 3.4.1.8 and per section 5.6.

5.3 Alternative Lighting Devices (ALD).

All light units must be visually examined for proper materials and assembly. The manufacturer must demonstrate that the ongoing production photometric test results show the manufacturing process meets the photometric requirements per paragraphs 3.4.1.2 through 3.4.1.8 and per section 5.6.

5.4 Discharge Light Unit Production Test.

All light units must be visually examined for proper materials and assembly. The units must be energized and tested to verify proper operation and conformance to photometric requirements as specified in Tables 5 and 6.

5.5 Production Operational Test.

All light units must be tested to verify specified operation per the following minimum standards.

a. Each unit must be operated a minimum of 24 hours at highest intensity and a minimum of 12 hours at lowest intensity.

b. During highest intensity operation, each unit must be monitored for FLASH/FAIL as defined in 3.3.5.1.1. Minimum acceptable quality is zero FAILs in 24 hours of high intensity operation.

c. After a minimum 36 hours elapsed time of operation each light unit must be tested to verify proper operation of the following:

- (1) All intensity step changes per paragraph 3.4.4.1
- (2) Proper operation of monitoring per paragraph 3.3.5.1.1
- (3) Proper interlock switch operation and discharge time to 50 volts (bank potential) per paragraph 3.3.11.
- (4) Simultaneous flashing and intensity changing for multi-light systems per paragraphs 3.4.3.1 and 3.3.5.1, respectively
- (5) Leakage current test per paragraph 3.3.15.

5.6 Production Photometric Test.

Photometric testing must be performed per Table 5 or Table 6 using either conventional sampling per column 2 or statistical process control (SPC) per column 3. If SPC is used for a characteristic, it must show statistical capability with $C_{pk} \geq 1.0$ and $\sigma \geq 3.0$.

Table 5. L-856/L-857 Production Photometric Requirements.

CHARACTERISTIC TESTED ⁽¹⁾	TEST POINTS	
	CONVENTIONAL	SPC
a) Beam peak (Day Intensity)	3 radials each unit: 1 at center of Horizontal beam +2 radials ± 45 degrees or ± 60 degrees from center	1 radial each unit, random orientation
b) Beam peak (Twilight Intensity)	Same radials as (a)	Same radials as (a)
c) Beam peak (Night Intensity)	Same radials as (a)	Same radials as (a)
d) Intensity at -10 degrees (Night)	Same radials as (a)	Same radials as (a)

NOTES:

(1) Characteristic must meet all specifications per paragraph 3.4.1.3 or 3.4.1.4.

Table 6. L-865/866/864⁽¹⁾ /885⁽¹⁾ Production Photometric Requirements.

CHARACTERISTIC TESTED ^(2,3)	TEST POINTS	
	CONVENTIONAL	SPC
a) Beam peak (Day Intensity)	4 radials each unit: equally spaced, random orientation	1 radial each unit, random orientation
b) Beam peak (Night Intensity)	Same radials as (a)	Same radials as (a)
c) Intensity at -10 degrees	Same radials as (a)	Same radials as (a)

NOTES:

(1) Discharge type and alternative light source light only.

(2) Characteristic must meet all specifications per paragraph 3.4.1.5 or 3.4.1.6.

(3) Day, night, and -10 degrees where applicable.

5.7 Production Test Records.

Records showing actual test results of all tests required by paragraph 5.5 must be maintained for a period of three years by the manufacturer. These records must be traceable to the units tested and in the case of discharge light units traceable by serial number.

5.8 Production Test Equipment.

All measuring and test equipment used in the production of obstruction lighting equipment classified under paragraph 1.2 must have its accuracy and precision maintained by a calibration program with traceability to ISO-10012 *Measurement Management Systems – Requirements for Measurement Processes and Measuring Equipment* or current industry accreditation criteria. The manufacturer must show that all production photometric testing equipment correlates to the certifying laboratory's equipment to within ± 5 percent. Photometric testing must be performed in a properly designed photometric range using a calibrated photometer. For discharge type flashing lights, all photometric measurements must be based on a minimum five flash average.

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***SUGGESTED SPECIFICATIONS
FOR
DETECTABLE WARNING PANELS***

1.0 General Requirements

1.1 This specification states the requirements for wet cast detectable warning panels for installation in curb ramps and hazardous areas.

1.2 Sample and Certified Test Reports

A representative sample of the proposed panel to be furnished must be submitted along with the required certified test reports for approval.

1.3 Standards

1.3.1 Detectable warning surface panels must comply with detectable warnings on walking surfaces section of the American with Disabilities Act (Title 49 CFR TRANSPORTATION, part 37.9 STANDARDS FOR ACCESSIBLE TRANSPORTATION FACILITIES, Appendix A, Section 4.29.2 DETECTABLE WARNINGS ON WALKING SURFACES.

2.0 Materials Requirements

Polymer concrete cast-in-place Detectable Warning Panels shall be manufactured using polymer concrete material. Polymer concrete material shall consist of calcareous and siliceous stone, glass fibers and thermo set polyester resin. The polymer concrete material shall be tested by an independent testing laboratory for chemical resistance and mechanical properties.

2.1 Chemical Resistance

Chemical Resistance	ASTM D-543
Simulated Sunlight	ASTM D-1501
Accelerated Service Test	ASTM D-756 Procedure "E"
Water Absorption	ASTM D-570

Material shall be determined to be acceptable if the following criteria are met. For chemical resistance, simulated sunlight, accelerated service test, and water absorption: retention of 75 percent of the control specimen values for load and deflection and no more than 2 percent change in weight. For flammability test, specimen should be self-extinguishing. For fungus resistance test the material should not allow any fungus growth. Smoke density shall be less than 0.5 at 1.5 minutes and less than 15 at 4 minutes. Surface flammability shall be less than 25.

2.2 Mechanical Properties

The mechanical properties of polymer concrete material shall be tested by an independent testing laboratory. Polymer concrete material shall have the following mechanical properties:

<u>Mechanical Properties</u>	<u>Average Value</u>	<u>Test Method</u>
Compressive Strength	11,430 PSI	ASTM C-170-99
Flexural Strength	3,330 PSI	ASTM C-580-02
Tensile Strength	1,710 PSI	ASTM C307-99
Shear Strength	11,670 PSI	ASTM D-372-02
Modulus of Elasticity	1,776,400 PSI	ASTM C-580

2.3 Construction

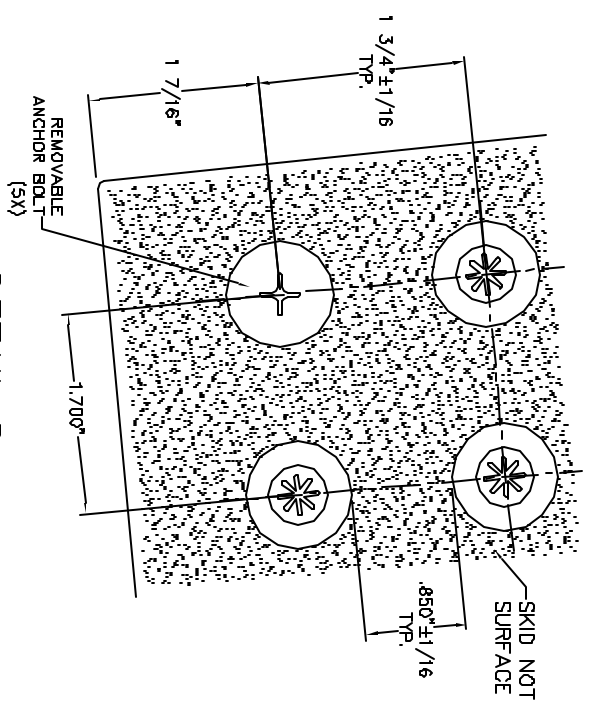
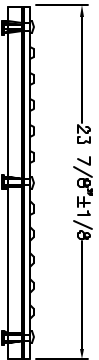
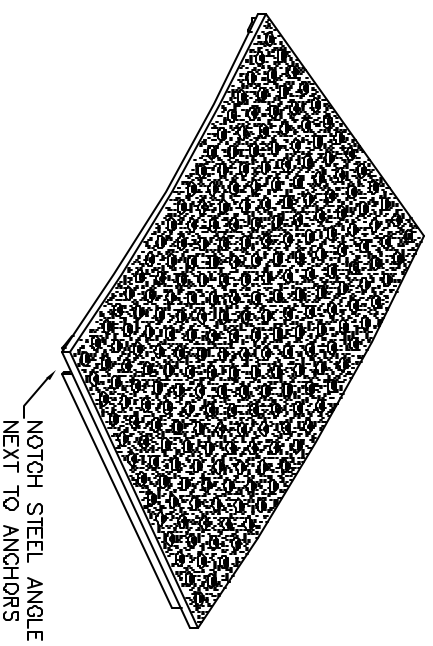
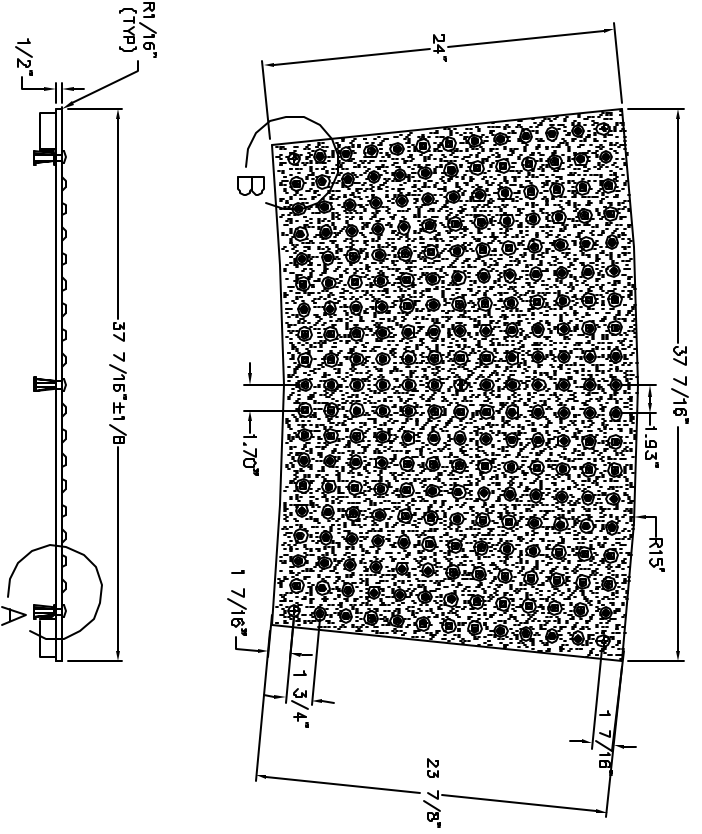
1. For consistency, detectable warning panels shall be manufactured using matched die molds under heat and pressure for superior material compaction, controlled chemical curing and uniform dimensions.
2. Polymer concrete detectable warning panels shall be reinforced with fiberglass mats for superior strength.
3. Polymer concrete detectable warning panels shall have ½” thick material sectional thickness excluding truncated domes height or reinforcement ribs.
4. Polymer concrete detectable warning panels shall be fitted with Zinc alloy concrete anchors and stainless steel bolts.
5. Polymer concrete panel surface shall be coated to keep the panel surface clean during installation. The coating shall be easily removable immediately after installation.
6. Polymer concrete detectable warning panels shall be fitted with hot dipped galvanized angles to facilitate installation in wet concrete.
7. Polymer concrete detectable warning panels shall be field replaceable without the need of cutting the existing concrete or pouring new concrete.
8. Slip Resistance of Polymer concrete detectable warning panel when tested by ASTM-C 1028 shall not to be less than 0.80.
9. Chemical Resistance of Tile when tested by ASTM-D 543 to withstand without any degradation or discoloration-1% hydrochloric acid, Acetic Acid, Sulfuric Acid, Sodium Chloride Sodium Hydroxide, Sodium Sulfate, Sodium Carbonate, Kerosene and Oil.
10. The material shall be abrasive resistant and shall be warranted for 5 years against excessive wear.
11. The polymer concrete material shall not sustain burning and be self extinguishing when tested in accordance with ASTM D 635.
12. The polymer concrete material shall not promote fungus growth when tested in accordance with ASTM G21.

13. The polymer concrete material surface flammability shall be tested in accordance with ASTM E-162 and shall be less than 25.
14. Smoke density shall be tested in accordance with ASTM E-662-03 and shall be less than 0.5 at 1.5 minutes and less than 15 at 4 minutes.

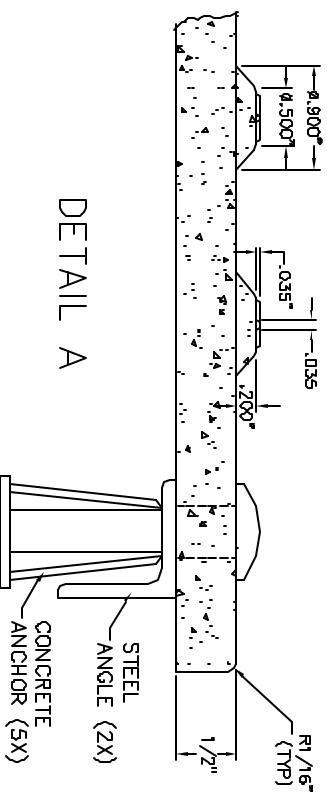
3.0 **Testing and Documentation Requirements**

- 3.1 The Polymer concrete Cast-In-Place Detectable Warning Panels specified is based on Armorcast Products Company (818-982-3600) or approved equal.
- 3.2 Certified test report must be submitted to demonstrate conformance to this specifications. Testing must be conducted by an independent testing laboratory.
- 3.3 Installation procedures must be submitted along with product drawings.

15' RADIUS PANEL



DETAIL B



DETAIL A

“XXX” DESIGNATE COLOR

A6-R15ADA

<p>ANNONCE PRODUCTS COMPANY 14320 S. SHERIDAN STREET DENVER, CO 80227 (303) 952-7500</p>		<p>15' RADIUS X 1/2" REPLACEMENT DETECTABLE WARNING PANEL</p>	
<p>DATE: 08/06</p>	<p>SCALE: NONE</p>	<p>PROJECT: POLYMER CONCRETE</p>	<p>DATE: 08/06</p>
<p>DESIGNER: WS</p>	<p>CONCRETE: A600R15ADA-XXX</p>	<p>CONCRETE: POLYMER CONCRETE</p>	<p>CONCRETE: POLYMER CONCRETE</p>

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SECTION GEO

GEOTECHNICAL REPORT



GEOTECHNICAL EXPLORATION

on

VITRUVIAN PARK
BUILDINGS 201, 202, AND 203
Off Vitruvian Way
Addison, Texas
ALPHA Report No. G152235

Prepared for:

UNITED DOMINION REALTY TRUST
3875 Ponte Avenue, Suite 400
Addison, Texas 75001
Attention: Ms. Deiadra Burns
October 21, 2015

Prepared By:

ALPHA TESTING, INC.
2209 Wisconsin Street, Suite 100
Dallas, Texas 75229

October 21, 2015

United Dominion Realty Trust
3875 Ponte Avenue, Suite 400
Addison, Texas 75001
Attention: Ms. Deidra Burns

Re: Geotechnical Exploration
Vitruvian Way
Buildings 201, 202, and 203
Addison, Texas
ALPHA Report No. G152235

Attached is the report of the geotechnical exploration performed for the project referenced above. This study was authorized by Mr. Harry G. Alcock and performed in accordance with the Abbreviated Agreement for Professional Services dated October 2, 2015 and ALPHA Proposal No. 48845 dated August 27, 2015.

This report contains results of field explorations and laboratory testing and an engineering interpretation of these with respect to available project characteristics. The results and analyses were used to develop recommendations to aid design and construction of foundations and pavement.

ALPHA TESTING, INC. appreciates the opportunity to be of service on this project. If we can be of further assistance, such as providing materials testing services during construction, please contact our office.

Sincerely,

ALPHA TESTING, INC.

Andrew M. Adams, E.I.T.
Project Manager



Mark L. McKay, P.E.
Senior Geotechnical Engineer
Geotechnical Department Manager

AMA/MLM
Copy: (1) Client



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On

ALPHA REPORT NO. G152235

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APPENDIX

SOIL MODIFICATION WATER PRESSURE INJECTION (WPI) GUIDELINE SPECIFICATIONS

A-1	Methods of Field Exploration Boring Location Plan – Figure 1
B-1	Methods of Laboratory Testing Swell Test Results – Figure 2 Logs of Borings Key to Soil Symbols and Classifications



1.0 PURPOSE AND SCOPE

The purpose of this geotechnical exploration is for ALPHA TESTING, INC. (“ALPHA”) to evaluate for the “Client” some of the physical and engineering properties of subsurface materials at selected locations on the subject site with respect to formulation of appropriate geotechnical design parameters for the proposed construction. The field exploration was accomplished by securing subsurface samples from widely spaced test borings performed across the expanse of the site. Engineering analyses were performed from results of the field exploration and results of laboratory tests performed on representative samples.

Also included are general comments pertaining to reasonably anticipated construction problems and recommendations concerning earthwork and quality control testing during construction. This information can be used to evaluate subsurface conditions and to aid in ascertaining construction meets project specifications.

Recommendations provided in this report were developed from information obtained in test borings depicting subsurface conditions only at the specific boring locations and at the particular time designated on the logs. Subsurface conditions at other locations may differ from those observed at the boring locations, and subsurface conditions at boring locations may vary at different times of the year. The scope of work may not fully define the variability of subsurface materials and conditions that are present on the site.

The nature and extent of variations between borings may not become evident until construction. If significant variations then appear evident, our office should be contacted to re-evaluate our recommendations after performing on-site observations and possibly other tests.

2.0 PROJECT CHARACTERISTICS

It is proposed to construct a new apartment complex and parking garage structures (Vitruvian Park) on a site located generally north off Vitruvian Way east of Marsh Lane in Addison, Texas.

A site plan illustrating the general outline of the property provided by the Client, with ALPHA’s boring locations noted on it, is provided as Figure 1, titled “Boring Location Plan,” in the Appendix of this report. At the time the field exploration was performed, the site was relatively open and vegetated with grass and scattered trees with a maintenance yard located in the north central portion of the site. According to online maps available from the North Central Texas Council of Governments (found at www.dfwmaps.com), the topography of the site generally slopes downward from the northeast towards the southwest with a maximum change in surface elevation of about 18 ft (about Elev. 568 to 550).

Present plans provide for the construction of new 5-story wood-framed apartment buildings and 5-story concrete parking garage structures. At least one level of the parking garage structures is planned partially below-grade. Based on the current available information, foundation loads for the parking garage structures could be on the order of 1,000 kips or less and it is anticipated these loads will be supported using a drilled pier foundation system. The apartment buildings are anticipated to create relatively light loads to be carried by the foundations. Pavement design recommendations for Portland cement concrete (PCC) are also provided in this report.



The finished floor elevations for the partial below-grade levels are assumed to be about 6 ft below existing grade and slab-on-grade foundations for the apartment buildings are assumed to be within about 2 ft of existing grade.

3.0 FIELD EXPLORATION

Subsurface conditions on the site were explored by drilling a total of twenty-three (23) test borings in general accordance with ASTM D 420 using standard rotary drilling equipment. Borings 1 through 6 were drilled in the parking garage areas to depths of about 70 ft each. Borings 7 through 23 were drilled in the proposed apartment building areas to a depth of 20 ft each. The approximate location of each test boring is shown on the Boring Location Plan, Figure 1, enclosed in the Appendix of this report. Details of drilling and sampling operations are briefly summarized in Methods of Field Exploration, Section A-1 of the Appendix.

Subsurface types encountered during the field exploration are presented on Log of Boring sheets included in the Appendix of this report. The boring logs contain our Field Technician's and Engineer's interpretation of conditions believed to exist between actual samples retrieved. Therefore, these boring logs contain both factual and interpretive information. Lines delineating subsurface strata on the boring logs are approximate and the actual transition between strata may be gradual.

4.0 LABORATORY TESTS

Selected samples of the subsurface materials were tested in the laboratory to evaluate their engineering properties as a basis in providing recommendations for foundation design and earthwork construction. A brief description of testing procedures used in the laboratory can be found in Methods of Laboratory Testing, Section B-1 of the Appendix. Individual test results are presented on Log of Boring sheets or on summary data sheets also enclosed in the Appendix.

5.0 GENERAL SUBSURFACE CONDITIONS

Based on the Geological Atlas of Texas, Dallas Sheet, available from the Texas Bureau of Economic Geology, published by the University of Texas at Austin, as well as the boring results and our experience at the Vitruvian site, the project site is generally located on the contact between the Austin Chalk Formation and the underlying Eagle Ford Formation. The Austin Chalk consists of massive gray unweathered limestone, overlain by tan weathered limestone. Near-surface residual soils associated with the Austin Chalk generally consist of high plasticity clays and/or low to moderate plasticity calcareous clays. The Eagle Ford Formation is composed predominantly of shale with occasional platy beds of sandstone and limestone. Residual overburden soils associated with the Eagle Ford Formation generally consist of clay and shaly clay with very high shrink/swell potential. In full section the Eagle Ford Formation should be over 200 ft thick at this site.

Subsurface materials consist generally of clay (CH), calcareous clay (CL), and/or shaly clay (CH) extending to depths of about 11 to 26 ft in Borings 1 through 6, 8, 12, 13, 14, 15, and 16, underlain by clay shale and deeper gray shale. The clay shale extended to depths of about 29 to 34 ft underlain by gray shale extending to the boring termination depths (70 ft). Shaly limestone



was encountered in Boring 14 at a depth of about 2 ft below existing grade and extended to a depth of about 11 ft underlain by clay shale. The upper 2 to 4 ft of material encountered in Borings 2, 4, 6, 11, 12, 13, 15, 16, 17, and 20 was visually classified as fill material. The letters in parenthesis represent the soils' classification according to the Unified Soil Classification System (ASTM D 2488). More detailed stratigraphic information is presented on the Log of Boring Sheets attached to this report.

Most of the subsurface materials are relatively impermeable and are anticipated to have a relatively slow response to water movement. Therefore, several days of observation will be required to evaluate actual groundwater levels within the depths explored. Also, the groundwater level at the site is anticipated to fluctuate seasonally depending on the amount of rainfall, prevailing weather conditions and subsurface drainage characteristics.

During the field explorations, free groundwater was encountered in the open boreholes upon completion of Borings 1 through 6 and 22 at depths of about 13 to 68 ft below the existing ground surface. No free groundwater was encountered in the other borings. It is common to detect seasonal groundwater from fill materials, from natural fractures within the clayey matrix, near the soil/rock (shale) interface or from fractures in the rock, particularly during or after periods of precipitation. If more detailed groundwater information is required, monitoring wells or piezometers can be installed.

Further details concerning subsurface materials and conditions encountered can be obtained from the Log of Boring sheets provided in the Appendix of this report.

6.0 DESIGN RECOMMENDATIONS

The following design recommendations were developed on the basis of the previously described Project Characteristics (Section 2.0) and General Subsurface Conditions (Section 5.0). If project criteria should change, including structure locations on the site, our office should conduct a review to determine if modifications to the recommendations are required. Further, it is recommended our office be provided with a copy of the final plans and specifications for review prior to construction.

Review of historical aerial photographs indicates the site was previously covered with apartment buildings which have since been removed. Any soil disturbed due to removal of the structures, foundations or pavements should be re-compacted in accordance with recommendations provided in Section 6.3 where moisture conditioned soil is required or Section 7.3 where general fill is required. All elements of the removed structures and pavement should be removed or cut off at least 1 ft below finished grade or 1 ft below the new structural elements, whichever is deeper. All abandoned utility lines should be either removed or positively sealed to prevent possible water seepage into subgrade soils.

The following design criteria given in this report were developed assuming the parking garage levels are about 6 ft below existing grade and slab-on-grade foundations for the apartment buildings are within 2 ft of existing grade. Cutting and filling on the site more than described



above can alter the recommended foundation design parameters. Therefore, it is recommended our office be contacted once detailed site grading plans are available to verify appropriate design parameters are utilized for final foundation design.

6.1 Existing Fill

As discussed in Section 5.0 of this report, existing fill was encountered to depths of about 2 to 4 ft below the existing ground surface in Borings 2, 4, 6, 11, 12, 13, 15, 16, 17, and 20. If compaction records for this fill cannot be obtained, the existing fill should be considered as uncontrolled fill. Uncontrolled fill is not suitable for direct support of slab foundations. Considering the soil improvements required to reduce potential seasonal movements of floor slabs (as discussed below in Section 6.3), it is expected most of the existing fill soil would be over-excavated and replaced in the building pad areas. Any existing fill encountered below the depth of moisture conditioning in the building pad areas should be removed to expose suitable firm native soils, and the resulting excavation filled to the building pad grade with controlled, engineered fill as described in Section 7.3 below. Pavement areas should be properly prepared and tested as discussed in Section 7.1 of this report.

Excavated materials can be utilized as engineered fill provided they are free of boulders, concrete, organics, debris, or other unsuitable materials. ALPHA TESTING should observe undercut excavations and monitor and test fill placement to verify conditions are as anticipated and that new fill is placed per the recommendations in this report.

6.2 Drilled Pier Foundation System

The structural frame and walls for the planned parking garages could be supported using a system of drilled, straight-shaft piers bearing in the gray shale. These piers should bear at least 3 ft into the underlying gray shale. Gray shale was encountered at depths of about 20 to 34 ft below existing grade in Borings 1 through 6. Based on the conditions encountered in the borings, laboratory testing and our area experience, the following allowable design values in Table A are recommended for the proposed structure. Deeper penetrations will be necessary to develop skin friction and/or uplift resistance.

TABLE A		
ALLOWABLE END BEARING AND SKIN FRICTION VALUES		
Material	End Bearing (ksf)	Skin Friction [Gravity Loads] (ksf)
All Existing Fill Material and Native Clay Soils to a Depth of 15 ft Below Final Grade	NA	Neglect
Native Clay Soils below a Depth of 15 ft from Final Grade	NA	0.5
Clay Shale and Upper 3 ft of Shale	NA	1.5
Shale Below a Minimum 3 ft of Penetration	18	2.5



Please note, the following special conditions apply to drilled pier foundations bearing in the gray shale at this site:

- 1. Gray clay shale was encountered overlying the gray shale bearing stratum in Borings 1, 2, 3, and 6 at depths of about 21 to 26 ft and is estimated to be about 7 to 13 ft thick. The clay shale has relatively softer strength characteristics compared to the deeper gray shale. The clay shale is visually similar to the shale, and care should be taken to verify the pier shafts extend through the relatively softer clay shale to bear in the competent gray shale. Pier shaft excavations should be monitored by ALPHA geotechnical personnel to verify penetration into the shale stratum.*
- 2. Varying amounts of hard limestone and/or sandstone seams and layers were encountered within the shale stratum at some of the borings. In addition, hard limestone layers were encountered at varying depths in test borings drilled for previous phases and during pier installation for previous structures. These layers are generally hard and could cause obstruction to pier installation. Rock excavation equipment (rock teeth and/or core barrels) may be required during pier installation. The contractor selected should have experience drilling piers in shale containing limestone seams and layers. The pier installation contract should contain provisions for penetrating these hard materials and other obstructions. Additionally, ALPHA Testing, Inc. should verify piers penetrate any clay layers and seams and bear in competent gray shale during installation.*

The minimum clear spacing between adjacent piers should be at least two (2) shaft diameters (based on the largest pier diameter) to develop the full skin friction resistance to gravity loads and uplift loads. Closer spacing will result in reduced skin friction resistance. We should be contacted to review closer pier spacing on a case-by-case basis.

The above bearing capacity contains a factor of safety of at least three (3) considering a general bearing capacity failure and the skin friction values have a factor of safety of at least two (2). Skin friction values in the gray shale are applicable only for the portion of the shaft in gray shale below the bottom of any temporary casing used. Normal elastic settlement of piers under loading is estimated at less than about 1 inch.

Each pier should contain sufficient full length reinforcing steel and should be embedded a sufficient distance into the gray shale to resist the uplift pressure (soil-to-pier adhesion) due to potential soil swell along the shaft from post-construction heave and other uplift forces applied by structural loadings. The magnitude of uplift adhesion due to soil swell along the pier shaft cannot be defined accurately and can vary according to the actual in-place moisture content of the soils during construction. It is estimated this uplift adhesion will not exceed about 2.2 kips per sq ft. This soil adhesion is approximated to act uniformly over the upper 12 ft of the pier shaft in contact with clayey soils. The uplift adhesion due to soil swell can be neglected over the portion of the shaft in contact with non-expansive material used to grade the building pads.



The uplift resistance of each pier can be computed using an allowable uplift skin friction values in Table B below. These uplift skin friction values can be assumed to act uniformly over the respective portions of the shaft in the clayey soils, clay shale, and shale. Skin friction values are applicable only for the portion of the shaft below the bottom of any temporary casing used. These uplift resistance values have a factor of safety of at least two (2).

TABLE B	
ALLOWABLE UPLIFT SKIN FRICTION VALUES	
MATERIAL	ALLOWABLE UPLIFT SKIN FRICTION (ksf)
All Existing Fill Material and Native Clay Soils to a Depth of 15 ft Below from Final Grade	Neglect
Native Clay Soils below a Depth of 15 ft from Final Grade	0.3
Clay Shale and Upper 3 ft of Shale	1.0
Shale Below a Minimum 3 ft of Penetration	1.8

All grade beams connecting piers should be formed and not cast in earthen trenches. Grade beams should be formed with a nominal 12-inch void at the bottom if constructed within about 2 ft of existing grade. Alternatively, a nominal 6-inch void should be provided below the bottom of grade beams in below-grade areas (assumed to be about 6 ft below final grade). Commercially available cardboard box forms (cartons) are made for the purpose of forming the void. The cardboard cartons should extend the full length and width of the grade beams. Prior to concrete placement, cartons should be inspected to verify they are firm, properly placed, and capable of supporting wet concrete. Some type of permanent soil retainer, such as pre-cast concrete panels, must be provided to prevent soils adjacent to grade beams from sloughing into the void space at the bottom of the grade beams. Additionally, backfill soils placed adjacent to grade beams must be compacted as outlined in Section 7.3 of this report.

Lateral analysis for drilled piers constructed at the site can be performed using the following design parameters (L-Pile) provided for the site soils in Tables C-1 and C-2. The lateral resistance of the top portion of the pier shafts (the portion within 12 ft of final grade) should be neglected due to disturbance and potential soil shrinkage.



Material	Unit Weight, pci	Soil Modulus Parameter, pci	Shear Strength, psi	Strain at 50% Max Stress	Angle of Internal Friction, deg.
Native Clay/Shaly Clay Deeper than 12 ft Below Existing Grade at Piers	0.069	500	7	0.007	0
Clay Shale and Upper 3 ft of Shale	0.075	6,000	20	0.005	0

Material	Unit Weight, pci	Young's Modulus (Rock Condition), psi	Shear Strength, psi	K_{rm}
Shale Below 3 ft Penetration	0.075	25,000	60	0.0005

Note: Rock Quality Designation (RQD) for shale is generally in the range of 40 to 80 percent. *Please Note:* Rock coring was not performed for this project. RQD values provided above are typical for the material encountered based on our area experience and from information obtained from field Texas Cone Penetration tests.

6.3 Potential Seasonal Movements and Subgrade Improvement

It is planned to construct the parking garage levels about 6 ft below existing grade and floor slabs for the apartment buildings within 2 ft of existing grade. Based on the subsurface stratigraphy encountered in the test borings performed at this site, the parking garage and apartment floor slabs will be supported on clayey soils. Our findings indicate the floor slab for the parking garage level could experience soil-related potential seasonal movements of about 4 inches if constructed at about 6 ft below existing and adjacent final grade. Alternatively, the slab-on-grade foundations for the apartment buildings could experience soil-related potential seasonal movements in excess of 5 ½ to 6 inches if constructed within 2 ft of existing grade. Once final grades are established and the locations of any ramps to below grade areas are located, ALPHA should be contacted to verify the subsequent PVR values and recommendations provided below.

These potential seasonal movements were estimated using results of absorption swell tests, in general accordance with methods outlined by Texas Department of Transportation (TxDOT) Test Method Tex-124-E and engineering judgment and experience. Estimated movements were calculated assuming the moisture content of the in-situ soil within the normal zone of seasonal moisture content change varies between a "dry" condition and a "wet" condition as defined by Tex-124-E. Also, it was assumed a 1 psi surcharge load from the slab acts on the subgrade soils. Movements exceeding those predicted above could occur if positive drainage of surface water is not maintained



or if soils are subject to an outside water source, such as leakage from a utility line or subsurface moisture migration from off-site locations.

In view of these potential seasonal movements, the most positive floor system for the buildings supported by drilled piers is a slab suspended completely above the existing highly expansive soils. A 12-inch or 6-inch void space should be provided between the bottom of the slab (or lowest suspended fixture) and top surface of the underlying expansive clays if the floor slab is constructed within about 2 ft of existing grade or about 6 ft below existing/adjacent final grade, respectively. Cardboard carton forms or a deeper crawl space can be used to create the minimum void space. A ventilated crawl space is preferred. Provisions should be made for (a) adequate drainage of the under-floor space and (b) differential movement of utility lines, including areas where the utility penetrates through the grade beam and/or where the utility penetrates below grade areas. If a crawl space is utilized, periodic inspections for plumbing line leaks, ponding water etc. should be performed with necessary repairs made.

If some floor slab movement is tolerable (about 2 inches or 1 inch), the concrete slab can be designed to bear uniformly on improved soils. The extent and depth of these subgrade improvement methods for the planned structures are summarized below in Tables D and E. These subgrade improvement procedures are discussed in Sections 6.3.1 and 6.3.2 below. Non-expansive material could consist of select fill, flexible base, or lime-treated on-site clayey soils as described in Section 7.3. The thickness of any gravel drainage layer below the slab (see Section 6.5 below) can also be counted as part of the thickness of non-expansive material. In choosing these methods of floor slab movement reduction, the Owner is accepting some post construction seasonal movement of the floor slab (2 inches or 1 inch).

TABLE D SUBGRADE IMPROVEMENT RECOMMENDATIONS FOR PARKING GARAGE FLOOR SLAB CONSTRUCTED ABOUT 6 FT BELOW EXISTING/ADJACENT FINAL GRADE	
Potential Seasonal Movement, inches	Subgrade Improvement Method
3	2 ft of Moisture Conditioned Soil
2	4 ft of Moisture Conditioned Soil
1	6 ft of Moisture Conditioned Soil



TABLE E SUBGRADE IMPROVEMENT RECOMMENDATIONS FOR APARTMENT SLAB-ON-GRADE FOUNDATIONS CONSTRUCTED WITHIN ABOUT 2 FT OF EXISTING GRADE	
Potential Seasonal Movement, inches	Subgrade Improvement Method
2	1 ft of Non-Expansive Fill Material, in Conjunction with either 9 ft of Moisture-Conditioned Soil or 10 ft of Water Pressure Injection below Slab
1	2 ft of Non-Expansive Fill Material, in Conjunction with either 10 ft of Moisture-Conditioned Soil or 10 ft of Water Pressure Injection below Slab

If a soil-supported floor slab is utilized for the planned building, a "floating" (fully ground supported, and not structurally connected to walls or foundations) floor slab is preferred. This reduces the risk of cracking and displacement of the floor slab due to differential movements between the slab and foundations. A floor slab doweled into perimeter grade beams can develop a plastic hinge (crack) parallel to and approximately 5 to 10 ft inside the building perimeter. The structural engineer should determine the need for connections between the slab and structural elements and determine if control joints to limit cracking are needed. A properly designed and constructed moisture barrier should be placed between the slab and subgrade soils to retard moisture migration through the slab.

6.3.1 Subgrade Improvement Utilizing Moisture-Conditioned Soil

Movements of the floor slabs for parking garage below-grade levels constructed about 6 ft below existing/adjacent final grade can be reduced to about 3 inches, 2 inches, or 1 inch by over excavating the existing clay soils and placing 2 ft, 4 ft, or 6 ft of moisture conditioned soils below the bottom of the floor slabs (See Table D).

Movements of apartment and amenity center building foundations constructed within about 2 ft of existing grade can be reduced to about 2 inches or 1 inch by placing at least 1 ft or 2 ft of non-expansive fill material, respectively, (See Table E) between the bottom of the slab and the top surface of 8 ft and 10 of moisture-conditioned soil, respectively. Non-expansive fill material could consist of select fill, flexible base, or lime-treated on-site clayey soils as described in Section 7.3.

Note: Limestone was encountered about 2 ft below existing grade in Boring 14. It is not necessary to excavate shallow limestone to install moisture conditioned soils. ALPHA should be present to observe any areas where the full subgrade treatment depth is not achieved.

Moisture conditioning consists of processing and compacting the specified minimum thickness of on-site soil at a "target" moisture content approximated to be at least 5 percentage points (with an upper limit of 7 percentage points) above the material's optimum moisture content as determined by the standard Proctor method (ASTM D



698). Relatively lower plasticity soils may need to be placed at a moisture content closer to optimum moisture to allow for compaction of these materials. The moisture-conditioned soil should be placed in 8-in thick loose lifts and compacted to a dry density of 93 to 97 percent of standard Proctor maximum dry density. Moisture conditioning of the on-site soil should extend throughout the entire building pad area and at least 5 ft beyond the perimeter of the building. In entrance areas and adjoining flatwork, the moisture conditioning process should extend at least 10 ft beyond the perimeter of the building. However, non-expansive fill material should not extend beyond the building limits. Moisture-conditioned soils should be maintained in a moist condition prior to placement of the required thickness of non-expansive material. *Non-expansive fill material should not be placed above the plastic sheeting.*

The resulting estimated potential seasonal movements (3 inches, 2 inches or 1 inch, depending on the level of subgrade improvement implemented) were calculated assuming the moisture content of the moisture-conditioned soil varies between the “target” moisture content and the “wet” condition while the deeper undisturbed in-situ soil within the normal zone of seasonal moisture content change varies between the "dry" condition and the "wet" condition as defined by methods outlined in TxDOT Test Method Tex-124-E.

Please note, it is the intent of the moisture-conditioning process described above to reduce the free swell potential of the moisture-conditioned soil to 1 percent or less. Additional laboratory tests (i.e., standard Proctors, absorption swell tests, etc.) should be conducted during construction to verify the “target” moisture content for moisture-conditioning (estimated at 5 percentage points above the material’s optimum moisture content as defined by ASTM D 698) is sufficient to reduce the free swell potential of the processed soil to 1 percent or less. In addition, it is recommended samples of the moisture-conditioned material be routinely obtained during construction to verify the free swell of the improved material is 1 percent or less.

Installation of moisture-conditioned soils should be monitored and tested on a full-time basis by a representative of ALPHA TESTING, INC., to verify the soils tested were placed with the proper lift thickness, moisture content, and degree of compaction.

6.3.2 Subgrade Improvement Utilizing Water Pressure Injection (WPI)

An alternate subgrade improvement method to reduce movement utilizes the procedures of Water Pressure Injection (WPI) in conjunction with placement of non-expansive fill material. Prior to water pressure injection, all remaining existing fill material should be removed and replaced as recommended in Section 7.3. The improvement procedures outlined below will not eliminate future movement of the slabs. Recommended specifications for WPI are attached to this report in the appendix.



Note: Limestone was encountered about 2 ft below existing grade in Boring 14. It is not practical nor necessary to inject beyond the limestone to perform the required injection depths. ALPHA should be present to verify the limestone in areas where injection refusal terminates above the full subgrade treatment depth.

For 2-inch Slab Foundation Movement: Following removal of the necessary thickness of on-site expansive soils to allow for placement of at least 1 ft of non-expansive material, the exposed subgrade of the building pad should be water pressure injected (WPI) to a depth of 10 ft below the bottom of the non-expansive material.

For 1 inch Slab Foundation Movement: Following removal of the necessary thickness of on-site expansive soils to allow for placement of at least 2 ft of non-expansive fill material, the exposed subgrade of the building pad should be water pressure injected (WPI) to a depth of 10 ft below the bottom of the non-expansive material.

The water pressure injection should extend throughout the entire building pad area and at least 5 ft beyond the perimeter of each building. In entrance areas and adjoining flatwork, WPI should extend at least 10 ft beyond the perimeter of the building. The non-expansive fill material should preferably not extend beyond the building limits. Where exterior flatwork does not adjoin the building pad, (i.e. above the water injected soils), a moisture barrier consisting of a minimum of 10 mil plastic sheeting with 8 to 12 inches of soil cover should be provided above the water injected soils. Injected soils should be maintained in a moist condition prior to placement of the required thickness of non-expansive fill material, plastic sheeting or flatwork.

Performance of post-injection swell testing and moisture content determinations should be employed as final acceptance criteria in engineering analysis to examine accomplishment of intended objectives of the injection treatment. Maximum benefit of these movement reduction procedures can be achieved by employing ALPHA TESTING, INC. to observe, monitor and test the entire process. Construction specifications for the water pressure injection process are provided in the Appendix of this report.

The purpose of the above procedure is to pre-swell the existing soils. Satisfactory completion of the injection process is achieved when the desired moisture content and abatement of swell in the injected subgrade clay soils are reached. Acceptance criteria for water pressure injection should be based upon obtaining an average free swell of 1 percent or less in the injected zone. Performance of post-injection swell testing and moisture content determinations should be employed as final acceptance criteria in engineering analysis to examine accomplishment of intended objectives of the injection treatment.



The resulting estimated potential seasonal movements were calculated assuming the average free swell of the injected soils does not exceed 1 percent. Further, it is assumed the moisture content of the soil below the injected zone and within the normal zone of seasonal moisture content change varies between a "dry" condition and a "wet" condition as defined by Tex-124-E.

6.4 Slab-on-Grade Foundations for Apartment and Amenity Center Buildings

We understand it is presently planned to support the apartment and amenity center buildings using a slab-on-grade foundation system designed for potential seasonal movements of either 2 inches or 1 inch. As discussed in Section 6.3 above, slab foundations on existing clays under current conditions will be subject to potential soil-related movements up to about 6 inches. Subgrade improvements (non-expansive fill material and moisture conditioning or water pressure injection) as described in Section 6.3 can be used to reduce slab foundation movements to 2 inches or 1 inch.

A slab-on-grade foundation should be designed with exterior and interior grade beams adequate to provide sufficient rigidity to the foundation system. A net allowable bearing pressure of 1.5 kips per sq ft may be used for design of all grade beams bearing subgrade improved soils placed as outlined in Section 6.3. Grade beams should bear a minimum depth of 18 inches below final grade and should have a minimum width of 10 inches.

It is common to experience some minor cosmetic distress to structures with slab-on-grade foundation systems due to normal ground movements. To reduce cracking as normal movements occur in subgrade soils, all grade beams and the floor slab should be adequately reinforced with steel (conventional reinforcing steel and/or post-tensioned reinforcement). A properly designed and constructed moisture barrier should be placed between the slab and subgrade soils to retard moisture migration through the slabs.

6.5 Post-Tensioning Institute, Design of Post-Tensioned Slabs-on-Ground

Provided below is information for the design of post-tensioned, slab-on-grade foundations. Design parameters provided below were evaluated based on the conditions encountered in the borings and using information and correlations published by PTI Third Edition and VOLFLO 1.5 computer program provided by Geostructural Tool Kit, Inc. (GTI).

TABLE F
Potential Seasonal Movement of 2 inches
Following Subgrade Improvement as Outlined in Section 6.3

	EDGE LIFT	CENTER LIFT
Edge Moisture Distance, ft (e_m)	4.3	7.0
Differential Soil Movement, inches (y_m)	1.6	1.2



TABLE G
Potential Seasonal Movement of 1 inch
Following Subgrade Improvement as Outlined in Section 6.3

	EDGE LIFT	CENTER LIFT
Edge Moisture Distance, ft (e_m)	4.3	7.5
Differential Soil Movement, inches (y_m)	1.4	1.1

6.6 Subgrade Improvement for Swimming Pool and Pool Decks

Potential movements for the swimming pool deck slabs could be reduced to about 1 inch by improving the subgrade soils beneath these structures as generally recommended in Section 6.3.1 and 6.3.2 of this report (placing 10 ft of moisture conditioned soil or 10 ft of water injected soils in conjunction with 2 ft of non-expansive material beneath the pool deck slab). However, the soil improvements for the pool should extend to a depth that matches the elevation of the adjoining deck slab subgrade treatment. Therefore, for a 5-ft deep pool, moisture conditioning should extend to a depth of at least 7 ft beneath the bottom of the pool. Select fill is not required beneath the pool where the pool is at least 2 ft deep. Subgrade improvement referenced above should extend at least 5 ft beyond the pool deck slab area. Following subgrade improvement as recommended above, the pool and pool deck slabs constructed on-grade could experience potential movements of about 1 inch.

6.7 Lateral Earth Pressures for Below-Grade Levels

Below grade walls of up to about 6 ft below grade are planned for the parking garage structures. The magnitude of lateral earth pressure against below-grade walls is dependent on the method of backfill placement, type of backfill soil, drainage provisions, and type of wall (rigid or yielding) after placement of the backfill. Experience demonstrates when a wall is held rigidly against horizontal movement (restrained at the top), the lateral pressure (at-rest lateral earth pressure) against the wall is greater than the normally assumed active pressure. Yielding walls (rotation at the top of the wall on the order of 0.1 to 0.4 percent of the wall height) can be designed for active earth pressures (k_a) but rigid walls associated with the apartment building structure should be designed for higher at-rest lateral earth pressures (k_o). Walls should be designed using the equivalent fluid pressures provided in Table H below, considering a triangular stress distribution and assuming a horizontal ground surface extending back from the top of the wall. The equivalent fluid pressures provided do not include a factor of safety.



**TABLE H
LATERAL EARTH PRESSURES**

Material	Condition	Equivalent Fluid Pressure, pcf	
		Drained	Undrained including Hydrostatic Pressure
Free Draining Granular Soil $\Phi=35^\circ$, $\gamma_T = 125$ pcf	At-Rest, $k_o=0.42$	53	89
	Active, $k_a=0.27$	34	79
Site Clay Soil $\Phi=15^\circ$, $\gamma_T = 120$ pcf	At-Rest, $k_o=0.74$	---	105
	Active, $k_a=0.59$	---	96

Φ – Internal friction and γ_T – Effective Total Unit Weight

Free draining granular material should be a clean, non-plastic, relatively well-graded granular soil consisting of sand, gravel, or a sand and gravel mixture with less than 5 percent finer than the No. 200 sieve size. To reduce surface water seepage into the free draining backfill, the top 2-ft of the backfill should consist of on-site clay soil with a plasticity index of at least 25. To utilize the lateral earth pressures associated with free draining granular material, the free draining granular backfill should extend outward at least 2 ft from the base of the wall and then extend upward on a 1 (horizontal) to 2 (vertical) slope. The free draining granular backfill should be separated from the adjacent native soils using a filter fabric (Mirafi 140N, or equivalent) to prevent intrusion of native soils into the free draining granular.

Complete drainage of the free draining material should be provided to prevent the development of hydrostatic pressures behind the wall. A typical drainage system could consist of perforated plastic PVC pipes placed in filter trenches excavated parallel to the base of the walls for their entire length. Septic field drain pipe is **not** acceptable for this purpose. The drain pipes should be positioned at a depth lower than the bottom elevation of the wall and should also be wrapped with filter fabric (Mirafi 140N, or equivalent). A drainage system is beneficial regardless of the type of backfill used. As a minimum, weep-holes should be provided for free-standing exterior walls. Subsurface drains are recommended behind below-grade areas such as walls associated with the structure. Such drains should drain by gravity or be connected to suitable sump pits and pumps.

The effects of surcharge loading must also be considered. Surcharge loads should be multiplied by the applicable coefficient of earth pressure from Table H above, and the resulting pressure should be applied as a uniform lateral pressure over the full height of the wall. The lateral earth pressure recommendations in Table H above assume a horizontal ground surface extending backward from the top of the wall. If sloping backfill is used, the lateral earth pressure on the below-grade wall will be higher. We should be contacted for additional lateral earth pressure recommendations if sloping backfill is used behind a wall.



Lightweight, hand-controlled vibrating plate compactors are recommended for compaction of backfill adjacent to walls to reduce the possibility of increases in lateral pressures due to over-compaction. Heavy compaction equipment should not be operated near the walls. Also, compaction of backfill soils behind walls should not exceed 100 percent standard Proctor maximum dry density (ASTM D 698) to further limit lateral earth pressures against walls.

Below-grade walls associated with the structure should be waterproofed, and keyed joints and waterstops should be provided at all construction joints.

Settlement of backfill behind the walls should be anticipated. Even though backfill is properly compacted as recommended in Section 7.3 of this report, the wall backfill is still subject to settlements over time of up to about 1 to 2 percent of the total fill thickness.

6.8 Below-Grade Drainage for Parking Garage Slab

Consideration should be given to utilizing a sub-floor drainage system for below-grade areas that are susceptible to potential groundwater infiltration. The sub-floor drainage system should be sloped to drain to suitable sump pits. Consideration should also be given to providing multiple sump pits with an emergency power source. Depending on the tolerance for occasional wet spots, consideration can be given to deleting the sub-floor drainage, especially in parking areas, and rely on the perimeter wall drainage systems for collection of seepage. The need for a sub-floor drainage system should be reviewed during construction.

If a sub-floor drainage system is utilized it should be situated a minimum of 12 inches below the bottom of the slab. The drain system could consist of collector pipes (minimum 6 inches in diameter, perforated and wrapped with filter fabric - Mirafi 140N, or equivalent) in shallow trenches or bearing on top of rock connected to a uniform drainage layer at least 12 inches thick. Spacing of the drain pipes should not exceed 25 ft.

The drainage layer should consist of free-draining gravel material with a maximum nominal particle size of 2 inches and not more than 5 percent passing the No. 200 sieve. Gravel meeting the gradation requirements of ASTM C-33 Size No. 57 is an example of a commercially available material suitable for this purpose. The sub-floor drainage system should be sloped to drain to suitable sump pits. Consideration should also be given to providing multiple sump pits with an emergency power source.

6.9 Site Retaining Walls

Low-level (maximum 4 ft in height) site retaining walls should be designed to resist the expected lateral earth pressures as recommended above in Section 6.7. These walls can be supported using drilled straight shaft piers as recommended in Section 6.2. As an alternate to drilled piers, site retaining walls (those not structurally associated with the building) could be supported by shallow spread footing foundations bearing in clayey soils if some level of foundation movement is tolerable (up to about 6 inches).



The proposed retaining walls supported using shallow footings bearing in native undisturbed soils can be designed using a net allowable bearing pressure of 2 ksf. Foundations should bear at a depth of at least 2 ft below the final ground surface as measured at the toe of the wall. The recommended footing depth is required for bearing capacity purposes only. The structural engineer should review the recommended bearing depth to verify the walls are sufficiently designed for global stability and to resist sliding, overturning, etc. Wall footings should have a least dimension of 18 inches for bearing capacity considerations.

Careful monitoring during construction is necessary to locate any pockets or seams of unsuitable material, which might be encountered in excavations for footings. Unsuitable materials encountered at the foundation bearing level should be removed and replaced with lean concrete (about 2,000 psi strength at 28 days).

Resistance to sliding will be developed by friction along the base of the footing and passive earth pressure acting on the vertical face of a key installed in the base of the footing, if required. We recommend an allowable coefficient of friction of 0.3 along the bottom of the footings bearing in clayey soils. The available passive earth resistance on the vertical face of a key installed in the base of the footing may be calculated using an allowable passive earth pressure of 500 psf for a key bearing against undisturbed native clay soils or cohesive fill soils placed as recommended in Section 7.3. Passive resistance on the vertical face of the footing within 2 ft of the final site grade should be neglected.

6.10 Flatwork

Flatwork, pavement and any other soil-supported building elements will be subjected to the same level of movement as discussed in Section 6.3 above. In any areas where post-construction movements of flatwork would be critical, flatwork should be structurally supported, or subgrade improvements as discussed in Section 6.3 should be considered.

6.11 Seismic Considerations

The Site Class for seismic design is based on several factors that include soil profile (soil or rock), shear wave velocity, and strength, averaged over a depth of 100 ft. Since our borings did not extend to 100-foot depths, we based our determinations on the assumption that the subsurface materials below the bottom of the borings were similar to those encountered at the termination depth. Based on Section 1613.3.2 of the 2012 International Building Code and Table 20.3-1 in the 2010 ASCE-7, we recommend using Site Class C (very dense soils and soft rock) for seismic design at this site.

6.12 New Area Pavement

Clay fill soils encountered at the borings, or similar materials used as engineered fill for grading the site could be encountered as subgrade material for the parking and drive areas. These materials should be improved and prepared prior to construction of pavements as recommended below in Section 7.1. To permit correlation between



information from test borings and actual subgrade conditions exposed during construction, a qualified Geotechnical Engineer should be retained to provide subgrade monitoring and testing during construction. If there is any change in project criteria, the recommendations contained in this report should be reviewed by our office.

Calculations used to determine the required pavement thickness are based only on the physical and engineering properties of the materials and conventional thickness determination procedures. Pavement joining the buildings should be constructed with a curb and the joint between the building and curb should be sealed. Related civil design factors such as subgrade drainage, shoulder support, cross-sectional configurations, surface elevations, reinforcing steel, joint design and environmental factors will significantly affect the service life and must be included in preparation of the construction drawings and specifications, but were not included in the scope of this study. Normal periodic maintenance will be required for all pavement to achieve the design life of the pavement system.

The recommended pavement sections provided below are considered the minimum necessary to provide satisfactory performance based on the expected traffic loading. In some cases, City minimum standards for pavement section construction may exceed those provided below.

6.12.1 Pavement Subgrade Preparation

In areas where clayey soils are exposed after final subgrade elevation is achieved, the exposed surface of the pavement subgrade soil should be scarified to a depth of 6 inches and mixed with a minimum 8 percent hydrated lime (by dry soil weight) in conformance with TxDOT Item 260. Assuming an in-place unit weight of 100 pcf for the pavement subgrade soils, this percentage of lime equates to about 36 lbs of lime per sq yard of treated subgrade. The actual amount of lime required should be confirmed by additional laboratory tests (ASTM C 977 Appendix XI) prior to construction. The soil-lime mixture should be compacted to at least 95 percent of standard Proctor maximum dry density (ASTM D 698) and at least 3 percentage points above the mixture's optimum moisture content. In all areas where hydrated lime is used to stabilize subgrade soil, routine Atterberg-limit tests should be performed to verify the resulting plasticity index of the soil-lime mixture is at/or below 15.

Please note, the on-site soils can contain a sufficient quantity of soluble sulfates that can adversely react with hydrated lime added during the mechanical lime stabilization process. Therefore, before committing to mechanical lime stabilization, samples of the pavement subgrade soil should be tested for the quantity of soluble sulfates. Our office should be contacted regarding evaluation of the quantity of soluble sulfates detected and any special processing/design features that may be applicable due to the soluble sulfate concentrations measured.



It is recommended that pavement subgrade stabilization procedures extend at least 1 ft beyond the edge of the pavement to reduce effects of seasonal shrinking and swelling upon the extreme edges of pavement.

Lime stabilization of the pavement subgrade soil will not prevent normal seasonal movement of the underlying untreated materials. Pavement and other flatwork will have the same potential for movement as slabs constructed directly on the existing undisturbed soils. Therefore, good perimeter surface drainage with a minimum slope of 2 percent away from the pavement is recommended. The use of sand as a leveling course below pavement supported on expansive clays should be avoided. Normal maintenance of pavement should be expected over the life of the structures.

6.12.2 Portland Cement Concrete (PCC) Pavement

Following subgrade improvement as recommended in Section 6.12.1 above, the following PCC (reinforced) pavement sections are recommended.

Paving Areas and/or Type	PCC Thickness, Inches
**Parking Areas Subjected Exclusively to Passenger Vehicle Traffic	5
Drive Lanes, Fire Lanes, Areas Subject to Light Volume Truck Traffic	6
Dumpster Traffic Areas	7

****Note:** Lime treatment of the pavement subgrade is not necessary for pavements subjected *exclusively* to passenger vehicle traffic, although lime treatment in these areas would be generally beneficial to the long-term performance of the pavement and improve constructability. Prior to construction of pavement on untreated clay subgrade soil, the exposed subgrade should be scarified to a depth of at least 6 inches and compacted to at least 95 percent of standard Proctor maximum dry density (ASTM D 698) and within the range of 1 percentage point below to 3 percentage points above the material's optimum moisture content.

Portland-cement concrete should have a minimum compressive strength of 3,000 lbs per sq inch (psi) at 28 days in parking areas subjected exclusively to passenger vehicle traffic. We recommend a minimum compressive strength of 3,500 per sq inch (psi) at 28 days for the street, drive lanes, fire lanes, and truck areas. Concrete should be designed with 5 ± 1 percent entrained air. Joints in concrete paving should not exceed 15 ft. Reinforcing steel should consist of No. 3 bars placed at 18 inches on-center in two directions.



Alternately, mechanical lime stabilization of the pavement subgrade could be eliminated by increasing the PCC thickness in the pavement sections presented above by 1 inch. Prior to construction of pavement on untreated clay subgrade soil, the exposed subgrade should be scarified to a depth of at least 6 inches and compacted to at least 95 percent of standard Proctor maximum dry density (ASTM D 698) and within the range of 1 percentage point below to 3 percentage points above the material's optimum moisture content.

6.13 Drainage and Other Considerations

Adequate drainage should be provided to reduce seasonal variations in the moisture content of foundation soils. All pavement and sidewalks within 5 ft of the structures should be sloped away from the buildings to prevent ponding of water around the foundations. Final grades within 5 ft of the structures should be adjusted to slope away from the structures at a minimum slope of 2 percent. **Maintaining positive surface drainage throughout the life of the structures is essential.**

In areas with pavement or sidewalks adjacent to the new structures, a positive seal must be maintained between the structure and the pavement or sidewalk to minimize seepage of water into the underlying supporting soils. Post-construction movement of pavement and flat-work is common. Normal maintenance should include examination of all joints in paving and sidewalks, etc. as well as re-sealing where necessary.

Several factors relate to civil and architectural design and/or maintenance, which can significantly affect future movements of the foundation and floor slab system:

1. Preferably, a complete system of gutters and downspouts should carry runoff water a minimum of 5 ft from the completed structures.
2. Large trees and shrubs should not be allowed closer to the foundations than a horizontal distance equal to roughly one-half of their mature height due to their significant moisture demand upon maturing.
3. Moisture conditions should be maintained “constant” around the edge of the slabs. Ponding of water in planters, in unpaved areas, and around joints in paving and sidewalks can cause slab movements beyond those predicted in this report.
4. Planter box structures placed adjacent to buildings should be provided with a means to assure concentrations of water are not available to the subsoil stratigraphy.
5. Architectural design of the floor slabs should avoid additional features such as wing walls as extensions of the slabs.



6. The root systems from existing or recently removed trees at this site will have dried and desiccated the surrounding clay soils, resulting in soil with near-maximum swell potential. Clay soils surrounding tree root mats in building pad and flatwork areas (including but not limited to sidewalks, driveways and patios) should be removed to a minimum depth of 3 ft and compacted in-place with moisture and density control as described in Section 7.3 of this report, below.

Trench backfill for utilities should be properly placed and compacted as outlined in Section 7.3 of this report and in accordance with requirements of local City standards. Since granular bedding backfill is used for most utility lines, the backfilled trench should not become a conduit and allow access for surface or subsurface water to travel toward the new structures. Concrete cut-off collars or clay plugs should be provided where utility lines cross building lines to prevent water from traveling in the trench backfill and entering beneath the structures.



7.0 GENERAL CONSTRUCTION PROCEDURES AND RECOMMENDATIONS

Variations in subsurface conditions could be encountered during construction. To permit correlation between test boring data and actual subsurface conditions encountered during construction, it is recommended a registered Professional Engineering firm be retained to observe construction procedures and materials.

Some construction problems, particularly degree or magnitude, cannot be anticipated until the course of construction. The recommendations offered in the following paragraphs are intended not to limit or preclude other conceivable solutions, but rather to provide our observations based on our experience and understanding of the project characteristics and subsurface conditions encountered in the borings.

7.1 Site Preparation and Grading

All areas supporting floor slabs, slab foundations, pavement, flatwork, or areas to receive new fill should be properly prepared.

After completion of the necessary stripping, clearing, and excavating and prior to placing any required fill, the exposed soil subgrade should be carefully evaluated by probing and testing. Any undesirable material (organic material, wet, soft, or loose soil) still in place should be removed.

The exposed soil subgrade should be further evaluated by proof-rolling with a heavy pneumatic tired roller, loaded dump truck or similar equipment weighing approximately 20 tons to check for pockets of soft or loose material hidden beneath a thin crust of possibly better soil.

Proof-rolling procedures should be observed routinely by a Professional Engineer, or his designated representative. Any undesirable material (organic material, wet, soft, or loose soil) exposed during the proofroll should be removed and replaced with well-compacted material as outlined in Section 7.3.

Prior to placement of any fill, the exposed soil subgrade should then be scarified to a minimum depth of 6 inches and recompact as outlined in Section 7.3.

If fill is to be placed on existing slopes (natural or constructed) steeper than six horizontal to one vertical (6:1), the fill materials should be benched into the existing slopes in such a manner as to provide a minimum bench-key width of five (5) ft. This should provide a good contact between the existing soils and new fill materials, reduce potential sliding planes, and allow relatively horizontal lift placements.

Slope stability analysis of embankments (natural or constructed) was not within the scope of this study.

The contractor is responsible for designing any excavation slopes, temporary sheeting or shoring. Design of these structures should include any imposed surface surcharges.



Construction site safety is the sole responsibility of the contractor, who shall also be solely responsible for the means, methods and sequencing of construction operations. The contractor should also be aware that slope height, slope inclination or excavation depths (including utility trench excavations) should in no case exceed those specified in local, state and/or federal safety regulations, such as OSHA Health and Safety Standard for Excavations, 29 CFR Part 1926, or successor regulations. Stockpiles should be placed well away from the edge of the excavation and their heights should be controlled so they do not surcharge the sides of the excavation. Surface drainage should be carefully controlled to prevent flow of water over the slopes and/or into the excavations. Construction slopes should be closely observed for signs of mass movement, including tension cracks near the crest or bulging at the toe. If potential stability problems are observed, a geotechnical engineer should be contacted immediately. Shoring, bracing or underpinning required for the project (if any) should be designed by a professional engineer registered in the State of Texas.

Due to the nature of the clayey soils found near the surface at the borings, traffic of heavy equipment (including heavy compaction equipment) may create pumping and general deterioration of shallow soils. Therefore, some construction difficulties should be anticipated during periods when these soils are saturated.

7.2 Foundation Excavations

All foundation excavations should be monitored to verify foundations bear on suitable material. The bearing stratum exposed in the base of all foundation excavations should be protected against any detrimental change in conditions. Surface runoff water should be drained away from excavations and not allowed to collect. All concrete for foundations should be placed as soon as practical after the excavation is made. Drilled piers should be excavated and concrete placed the same day.

Prolonged exposure of the bearing surface to air or water will result in changes in strength and compressibility of the bearing stratum. Therefore, if delays occur, straight shaft drilled piers should be slightly widened and deepened to provide a fresh penetration surface, or a new (deeper) full penetration should be provided. Grade beam excavations for slab foundations should be slightly deepened and cleaned, in order to provide a fresh bearing surface.

All pier shafts should have a diameter of at least $1/30^{\text{th}}$ of the shaft length or 1.5 ft, whichever is greater, to facilitate clean-out of the base and proper monitoring. Concrete placed in pier holes should be directed through a tremie, hopper, or equivalent. Placement of concrete should be vertical through the center of the shaft without hitting the sides of the pier or reinforcement to reduce the possibility of segregation of aggregates. Concrete placed in piers should have a minimum slump of 5 inches (but not greater than 7 inches) to avoid potential honey-combing.

Observations during pier drilling should include, but not necessarily be limited to, the following items:



Verification of proper bearing strata and consistency of subsurface stratification with regard to boring logs,

Confirmation the minimum required penetration into the bearing strata is achieved,

Complete removal of cuttings from bottom of pier holes,

Proper handling of any observed water seepage and sloughing of subsurface materials,

No more than 2 inches of standing water should be permitted in the bottom of pier holes prior to placing concrete, and

Verification of pier diameter, and steel reinforcement.

Groundwater was noted at depths of about 13 to 68 ft in Borings 1 through 6 and 22 immediately upon completion of drilling. From our experience, groundwater seepage could also be encountered at shallow depths at the site during pier installation, and the risk of encountering seepage is increased during or after periods of precipitation. Submersible pumps, bailing tools, and/or temporary casing may be required to control groundwater seepage encountered during the pier drilling. The casing should be properly seated into clay or shale below the depth of seepage and groundwater should be removed prior to beginning the design penetration. As casing is extracted, care should be taken to maintain a positive head of plastic concrete and minimize the potential for intrusion of sloughing of fill soils. It is recommended a separate bid item be provided for casing on the contractor's bid schedule. Pier drilling contractors experienced in similar soil and groundwater conditions should be utilized for this project.

Groundwater can also occur within fractures in the bearing stratum and this may require extending the casing and deepening the piers. From our experience with similar soil and rock conditions, sometimes groundwater cannot be controlled by the use of casing, and underwater placement of pier concrete may be required. Special mix designs are usually required for tremied or pumped concrete. Proper concreting procedures should include placement of concrete from the bottom to the top of the pier using a sealed tremie or pumped concrete. The tremie should be maintained at least 5 ft into the wet concrete during placement. It is recommended a separate bid item be provided for casing and underwater concrete placement on the contractor's bid schedule. Pier drilling contractors experienced in similar soil and groundwater conditions should be utilized for this project.

Although not encountered at the borings, fill materials can contain debris which can cause obstruction to pier installation. The pier installation contract should contain provisions for penetration or removal of obstructions.

Hard limestone seams and layers were encountered at various depths within the gray shale bearing stratum for drilled piers. *Further, hard limestone layers were encountered at varying depths during pier installation for structures in other phases of development.*



These limestone layers within the shale are often discontinuous and can occur randomly with depth. Some of these materials are very hard and could cause obstruction to pier installation. Rock teeth and/or core barrels may be required during excavation for drilled pier foundations. The drilled pier contract should contain provision for the penetration or removal of obstructions.

7.3 Fill Compaction

Select, Non-Expansive Fill: Materials used as select, non-expansive fill should have a liquid limit less than 35, a plasticity index (PI) not less than 5 nor greater than 15. All select, non-expansive fill should contain no deleterious material and should be compacted to a dry density of at least 98 percent standard Proctor maximum dry density (ASTM D 698) and within the range of 1 percentage point below to 3 percentage points above the material's optimum moisture content. (Note: The plasticity index and liquid limit of material used as select, non-expansive fill should be verified during fill placement using laboratory tests. Visual observation and classification should not be relied upon to confirm the material to be used as select, non-expansive fill satisfies the above Atterberg-limit criteria.)

Flexible Base Material: Flexible Base material used as non-expansive fill for the building pad area should meet the requirements of TxDOT Item 247, Type A, Grade 1 or 2. Processed concrete meeting TxDOT Item 247, Grade 1 or 2, Type D is also acceptable for as non-expansive material. The material should be compacted to a minimum 95 percent of standard Proctor maximum dry density (ASTM D 698) and within 3 percentage points of the material's optimum moisture content.

The following recommendations pertain to fill soils placed for general site grading as follows:

- *Outside* the designated building pad areas *if* moisture conditioning will be used as the method for subgrade improvement. Where moisture conditioning is utilized for subgrade improvement, all fill within the designated building pad areas, plus at least 5 ft outside the limits of the building pad areas, should meet the requirements of Section 6.3 discussed earlier.
- For general grading *including* building areas *if* water pressure injection will be used as the method for subgrade improvement.

Clay and shaly clay soils with a plasticity index equal to or greater than 25 should be compacted to a dry density between 93 and 98 percent of standard Proctor maximum dry density (ASTM D 698). The compacted moisture content of the clays during placement should be within the range of 2 to 6 percentage points above optimum.

Clay fill should be processed and the largest particle or clod should be less than 6 inches prior to compaction.

Compaction should be accomplished by placing fill in about 8-inch thick loose lifts and compacting each lift to at least the specified minimum dry density. Field density and moisture content tests should be performed on each lift.



In cases where either mass fills or utility lines are more than 10 ft deep, the fill/backfill below 10 ft should be compacted to at least 98 percent of standard Proctor maximum dry density (ASTM D-698) and within 2 percentage points of the material's optimum moisture content. The portion of the fill/backfill shallower than 10 ft should be compacted as outlined above.

Even if fill is properly compacted, fills in excess of about 10 ft are still subject to settlements over time of up to about 1 to 2 percent of the total fill thickness. This should be considered when designing utility lines under pavements and/or wall backfill.

7.4 Groundwater

Groundwater was encountered in Borings 1 through 6 and 22 at depths of about 13 to 68 ft below the existing ground surface immediately following completion of drilling. From our experience with similar soils, groundwater seepage could be encountered in excavations for grade beams, foundations, utility conduits and other general excavations.

The risk of encountering seepage increases with depth of excavation and during or after periods of precipitation. Standard sump pits and pumping may be adequate to control minor seepage on a local basis.

In any areas where cuts made to establish final grades, attention should be given to possible seasonal water seepage that could occur through natural cracks and fissures in the newly exposed stratigraphy. In these areas subsurface drains may be required to intercept seasonal groundwater seepage. The need for these or other dewatering devices should be carefully addressed during construction. Our office could be contacted to visually observe final grades to evaluate the need for such drains.



8.0 LIMITATIONS

Professional services provided in this geotechnical exploration were performed, findings obtained, and recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. The scope of services provided herein does not include an environmental assessment of the site or investigation for the presence or absence of hazardous materials in the soil, surface water or groundwater. ALPHA, upon written request, can be retained to provide these services.

ALPHA TESTING, INC. is not responsible for conclusions, opinions or recommendations made by others based on this data. Information contained in this report is intended for the exclusive use of the Client (and their designated design representatives), and is related solely to design of the specific structures outlined in Section 2.0. No party other than the Client (and their designated design representatives) shall use or rely upon this report in any manner whatsoever unless such party shall have obtained ALPHA's written acceptance of such intended use. Any such third party using this report after obtaining ALPHA's written acceptance shall be bound by the limitations and limitations of liability contained herein, including ALPHA's liability being limited to the fee paid to it for this report. Recommendations presented in this report should not be used for design of any other structures except those specifically described in this report. In all areas of this report in which ALPHA may provide additional services if requested to do so in writing, it is presumed that such requests have not been made if not evidenced by a written document accepted by ALPHA. Further, subsurface conditions can change with passage of time. Recommendations contained herein are not considered applicable for an extended period of time after the completion date of this report. It is recommended our office be contacted for a review of the contents of this report for construction commencing more than one (1) year after completion of this report. Non-compliance with any of these requirements by the Client or anyone else shall release ALPHA from any liability resulting from the use of, or reliance upon, this report.

Recommendations provided in this report are based on our understanding of information provided by the Client about characteristics of the project. If the Client notes any deviation from the facts about project characteristics, our office should be contacted immediately since this may materially alter the recommendations. Further, ALPHA TESTING, INC. is not responsible for damages resulting from workmanship of designers or contractors. It is recommended the Owner retain qualified personnel, such as a Geotechnical Engineering firm, to verify construction is performed in accordance with plans and specifications.



APPENDIX





SOIL MODIFICATION WATER PRESSURE INJECTION (WPI) GUIDELINE SPECIFICATIONS

Purpose

The purpose of this specification is to provide a procedural basis for using water pressure injection as a method to obtain a relatively uniform, moist, pre-swelled zone of soil beneath the floor slab. Specifically, the intent of this procedure is to reduce the average free swell potential of soils within the injected zone to 1 percent or less.

Material

1. Only potable water shall be used during the entire injection process.
2. A non-ionic surfactant (wetting agent) will be added to the water according to manufacturer's recommendations, but, in no case will proportions be less than one part (undiluted) per 3,500 gallons of water.

Application

1. The water pressure injection work shall be accomplished after the site has been brought to near final subgrade elevation and prior to installation of any plumbing, trenches and utilities.
2. The injection vehicle will have a minimum gross weight of 5 tons and shall be capable of making straight vertical penetrations to minimize pressure loss around the injector rods to at least 10 ft.
3. Injections will be continued to "REFUSAL" (until the maximum reasonable quantity of water has been injected into the soil and water is flowing freely at the surface, either out of previous injection holes or from areas where the surface soils have fractured. The amount of water flowing from the areas described above will be approximately equivalent to the volume of water being pumped into the soil. As a minimum, injections should be at least 30 seconds at each injection interval unless altered by the Geotechnical Engineer).

Note: Loss of water or blow-back around injector pipes does not constitute refusal. Continued loss of water in this manner may indicate inadequate injection equipment or techniques, or in some instances, surficial soils that will not form an adequate seal to contain the water. In either instance, the owner's representative should be contacted and an on-site observation made to determine appropriate steps to achieve adequate injection.

After completion of water injection, the injection contractor will submit records which reflect the total quantity of water used. The injection contractor will be totally responsible for determining the means and methods of injecting the on-site soils such that the average free swell of soils within the injected zone does not exceed 1 percent.



4. Injection pipe(s) will penetrate the soil in approximately 12 to 18-inch intervals, injecting to refusal at each interval for a total depth of 10 ft or impenetrable material, whichever occurs first. If a seemingly impenetrable layer is encountered, ALPHA TESTING, INC. must be contacted to evaluate the significance of the lack of penetration with the injector tubes or provide alternate recommendations. A minimum of seven (7) injection intervals will be provided for the 10-ft injection depth. The lower portion of the injection pipe will consist of a hole pattern that will uniformly disperse water throughout the entire depth.
 5. Spacing for the injections will not exceed 5 feet on-center each way. Subsequent injections will be offset laterally at one-half the distance in both directions between the original injection centers.
 6. Injection pressures should be adjusted to inject the greatest quantity of water possible within a pressure range of 50 - 200 psi pump pressure.
 7. After a minimum curing time of 48 hours, the water injected pad shall be tested for moisture content and swell abatement to determine if additional injections with water are necessary. Subsequent water injections will be 5 feet on-center each way and spaced 2½ feet offset in two orthogonal directions from the initial injection.
 8. Upon completion of the final water pressure injection, the top surface of the injected pad should be scarified to a depth of at least 6 inches and re-compacted to between 93 and 98 percent of the optimum density, at a moisture content between 2 and 4 percentage points above the optimum values, as defined by ASTM D-698. Compaction tests should be performed at a frequency of 1 test per 5,000 sq ft with a minimum of three (3) tests per pad.
 9. The moisture content of the injected soils will be maintained until the floor slab is placed. Loss of moisture from the surface or sides of the building pad must be prevented by watering or use of a membrane. Any open trenches should be sealed or kept wet to prevent loss of moisture. All trenches should be backfilled with the excavated material. The moisture content of the backfill should be maintained in the range of 2 to 4 percentage points above optimum.
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Special Considerations

Several water injections may be required to achieve the desired final moisture content and corresponding soil swell abatement. Due to variations in the subsurface soils, the number of injection passes required to reduce the swell potential of the injected soils to 1 percent or less is unknown. Hence, the Client should allow for extra construction time on the site considering the time frame required to achieve the desired reduction in swell potential is unknown. Further, the contract with the Injection Contractor should address the situation where more injection passes than predicted are required to achieve the desired result.

Between the time the subgrade is water pressure injected and either the select fill material or plastic sheeting is placed, the upper surface of the injected soil should not be allowed to dry. To allow for adequate pre-swelling of the soils from the injection procedure, concrete for slabs should not be placed above injected areas until at least two (2) weeks following the final water injection. During this two-week period, the surface of the injected soil must be kept moist or covered with plastic sheeting to prevent moisture loss. About 3 to 4 inches or more of heave can be expected in building pad during and shortly after completion of the injection process.

Additionally, experience indicates injection adjacent to existing structures supported at or near the existing ground surface (such as, but not limited to, buildings, roads, and utility conduits) can result in swelling of soil in the injected zone as well as those beneath existing nearby structures. Swelling of soil supporting existing floor slabs can result in distress (movement) to existing buildings. Therefore, if an existing building or other structure is located within 30 ft of the proposed water injection area, it is recommended a temporary vertical moisture barrier be installed longitudinally between the existing structure and the injected pad to prevent injected water from entering the subgrade of the existing structure. The moisture barrier could consist of a 12 ft deep trench, about 1 ft wide, backfilled with lean concrete or other suitable relatively impermeable material.



Monitoring

A full-time ALPHA TESTING, INC. technician should be retained and present throughout the injection operations. Moisture content and free swell samples should be taken at 1-foot intervals to the total depth injected from a minimum of one test boring per each 4,000 sq feet of injected area (minimum two borings per pad). The moisture content and shear strength (using a pocket-penetrometer) will be determined for each sample. One-dimension free swell tests (ASTM D 4546-85 Method B) will be performed on selected samples at a frequency of at least two three (3) free swell tests per test boring for the 10 ft injection depth. The free swell tests will be performed with a surcharge equal to the overburden pressure anticipated upon completion of the new structure. Based upon the test results, the current swell potential of the injected soils should be determined by the project Geotechnical Engineer. Acceptance criteria for water pressure injection will be based upon achieving the potential movements indicated in the Geotechnical Exploration. As a guide, an average free swell of 1 percent or less in the injected zone could be used for planning. However, due to variations in the soils across the site, an average free swell of more than 1 percent may be allowable in some areas. Acceptance of soils with average free swells of more than 1 percent should be evaluated by ALPHA TESTING, INC. Depending upon the moisture content and the potential swell remaining in the existing injected soils, additional injections with water containing surfactant may be required until these requirements are met.

Wet and soft surface conditions resulting from the water injection procedures will require the contractor to provide access to drilling equipment used to obtain the soil samples which verify the injection process. Special track equipment may be required to provide the required access. The contractor will be responsible for providing and operating suitable equipment to permit sampling of the injected soils (test borings) with a standard truck-mounted drilling rig.



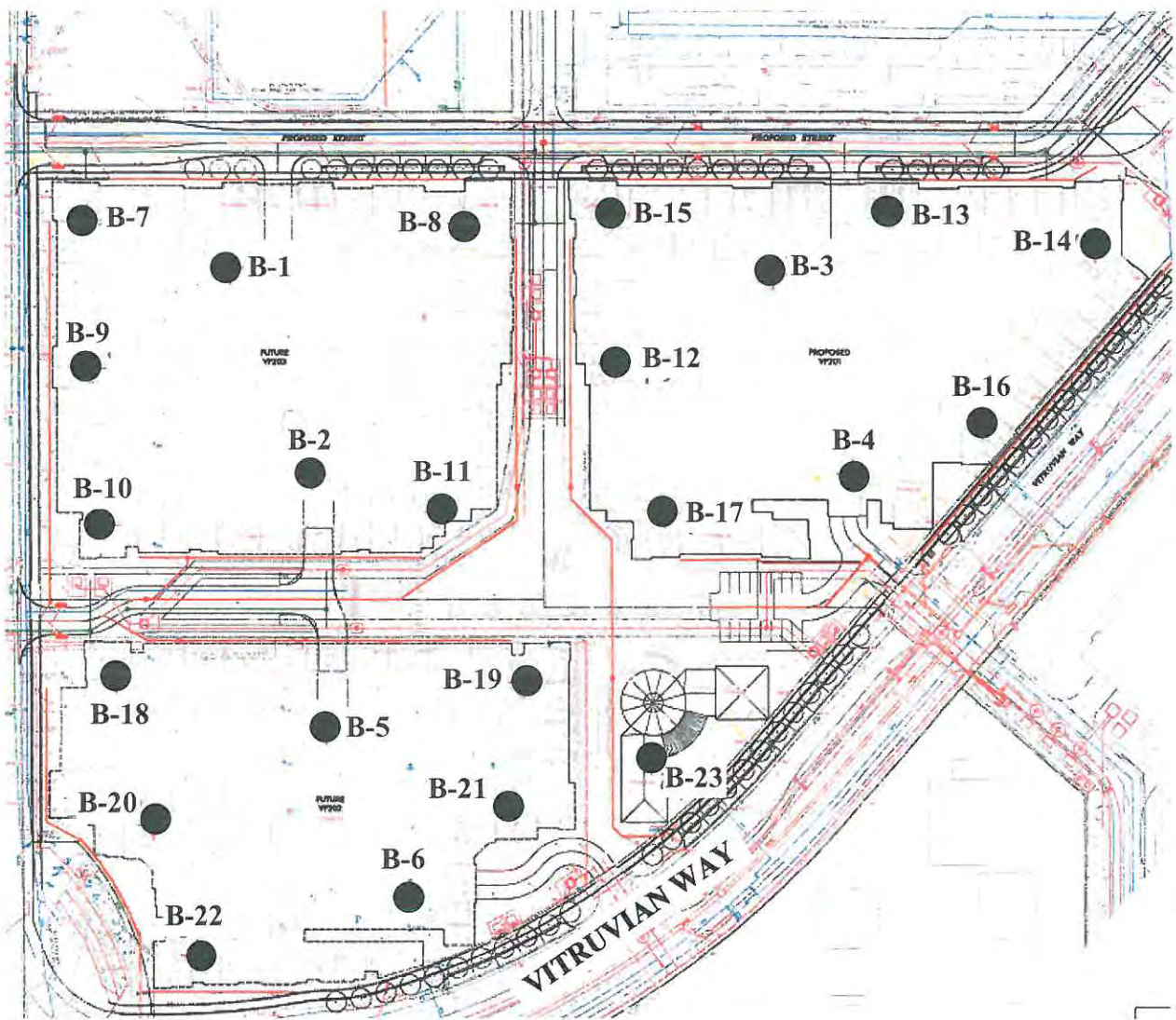
A-1 METHODS OF FIELD EXPLORATION

Using standard rotary drilling equipment, a total of twenty-three (23) test borings were performed for this geotechnical exploration at the approximate locations shown on the Boring Location Plan, Figure 1. The test boring locations were located by using a handheld GPS device or by pacing or taping and estimating right angles from landmarks which could be identified in the field and as shown on the site plan provided during this study. The locations of the test borings shown on the Boring Location Plan are considered accurate only to the degree implied by the method used to locate the borings.

Relatively undisturbed samples of the cohesive subsurface materials were obtained by hydraulically pressing 3-inch O.D. thin-wall sampling tubes into the underlying soils at selected depths (ASTM D 1587). These samples were removed from the sampling tubes in the field and examined visually. One representative portion of each sample was sealed in a plastic bag for use in future visual examinations and possible testing in the laboratory.

Texas Cone Penetration (TCP) tests were used to assess the apparent in-place strength characteristics of the materials encountered at the borings. The tests were conducted in accordance with TxDOT Test Method TEX 132-E. A 3-inch diameter steel cone driven by a 170-pound hammer dropped 24 inches is the basis for Texas Department of Transportation (TxDOT) strength correlations. Depending on the resistance (strength) of the materials, either the number of blows of the hammer required to provide 12 inches of penetration, or the inches of penetration of the cone due to 100 blows of the hammer are recorded on the field logs and are shown on the Drilling Logs.

Logs of all borings are included in the Appendix of this report. The logs show visual descriptions of subsurface strata encountered using the Unified Soil Classification System. Sampling information, pertinent field data, and field observations are also included. Samples not consumed by testing will be retained in our laboratory for at least 14 days and then discarded unless the Client requests otherwise.



● Approximate Boring Locations



Geotechnical Exploration
 Vitruvian Park - Buildings 201, 202 and 203
 Off Vitruvian Way
 Addison, Texas
 Alpha Project No. G152235



Boring Location Plan
 Figure 1



B-1 METHODS OF LABORATORY TESTING

Representative samples were examined and classified by a qualified member of the Geotechnical Division and the boring logs were edited as necessary. To aid in classifying the subsurface materials and to determine the general engineering characteristics, natural moisture content tests (ASTM D 2216), Atterberg-limit tests (ASTM D 4318), and dry unit weight determinations were performed on selected samples. In addition, unconfined compression tests (ASTM D 2166) and pocket-penetrometer tests were conducted on selected soil samples to evaluate soil shear strength. Results of all laboratory tests described above are provided on the accompanying Log of Boring sheets.

In addition to the Atterberg-limit tests, the expansive properties of the clay soils were further analyzed by absorption swell tests. The swell test is performed by placing a selected sample in a consolidation machine and applying either the approximate current or expected overburden pressure and then allowing the sample to absorb water. When the sample exhibits very little tendency for further expansion, the height increase is recorded and the percent free swell and total moisture gain calculated. Results of the absorption swell test are provided on the Swell Test Data sheet, Figure 2 included in this appendix.

SWELL TEST DATA

Boring No.	1	2	3	4	5
Average Depth, ft	14	14	9	14	14
Dry Unit Weight, pcf	106	105	98	89	102
Liquid Limit	66	69	71	79	67
Plastic Limit	22	23	24	30	23
Plasticity Index	44	46	47	49	44
Initial Moisture Content	18%	23%	26%	34%	25%
Final Moisture Content	24%	26%	29%	37%	27%
Free Swell	0.8%	1.5%	0.0%	0.0%	0.3%

Boring No.	6	7	8	10	12
Average Depth, ft	9	9	3	5	7
Dry Unit Weight, pcf	107	103	110	97	103
Liquid Limit	41	76	72	70	76
Plastic Limit	17	26	24	24	25
Plasticity Index	24	50	48	46	51
Initial Moisture Content	20%	21%	20%	26%	25%
Final Moisture Content	23%	24%	25%	30%	28%
Free Swell	0.0%	0%	4.4%	0%	1.5%

Boring No.	13	15	16	17	18
Average Depth, ft	5	9	5	14	3
Dry Unit Weight, pcf	92	100	110	86	103
Liquid Limit	62	66	73	89	70
Plastic Limit	21	22	26	28	24
Plasticity Index	41	44	47	61	46
Initial Moisture Content	26%	26%	19%	39%	23%
Final Moisture Content	29%	29%	23%	39%	29%
Free Swell	0%	1.5%	2.8%	0%	4.7%

Boring No.	19	20	21	22	23
Average Depth, ft	7	3	5	9	3
Dry Unit Weight, pcf	102	98	95	108	99
Liquid Limit	35	70	79	56	71
Plastic Limit	18	24	24	21	25
Plasticity Index	17	46	55	35	46
Initial Moisture Content	19%	27%	25%	21%	24%
Final Moisture Content	24%	30%	32%	24%	32%
Free Swell	0%	0.8%	1.6%	0.7%	3.7%

Geotechnical Exploration
 Vitruvian Park - Buildings 201, 202 and 203
 Off Vitruvian Way
 Addison, Texas
 Alpha Project No. G152235



Swell Test Data
 Figure 2

Client: DCO Realty, Inc.
Project: Vitruvian Park - Buildings 201, 202 and 203
Start Date: 10/6/2015 End Date: 10/6/2015
Drilling Method: CONTINUOUS FLIGHT AUGER

Location: Addison, Texas
Surface Elevation: _____
West: _____
North: _____
Hammer Drop (lbs / in): 170 / 24




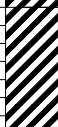

Depth, feet	Graphic Log	GROUND WATER OBSERVATIONS		Sample Type	Recovery % RQD	TX Cone or Std. Pen. (blows/ft.in)	Pocket Penetrometer (tsf)	Unconfined Comp. Strength (tsf)	% Passing No. 200 Sieve	Unit Dry Weight (pcf)	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
		▽ On Rods (ft): <u>15</u>	▼ After Drilling (ft): <u>Dry</u>											
MATERIAL DESCRIPTION														
5		Dark Brown CLAY	6.0				2.0				29			
		Tan and Gray CLAY					3.0				31			
10							4.0				33			
15		Tan and Gray SHALY CLAY	13.0				4.5+				24	66	22	44
20		-gray below 18'					4.5+				18			
25		Gray CLAY SHALE	22.0				100/ 7.5"							
30		Gray SHALE with limestone seams	29.0				100/ 6"							
35							100/ 6"							
40							100/ 3.5"							
45							100/ 4"							
50							100/ 5.5"							
55							100/ 3"							
60							100/ 6"							
65							100/ 5"							
70				70.0			100/ 2.5"							
75		TEST BORING TERMINATED AT 70 FT												

Client: DCO Realty, Inc. Location: Addison, Texas
 Project: Vitruvian Park - Buildings 201, 202 and 203 Surface Elevation: _____
 Start Date: 10/2/2015 End Date: 10/2/2015 West: _____
 Drilling Method: CONTINUOUS FLIGHT AUGER North: _____
 Hammer Drop (lbs / in): 170 / 24

Depth, feet	Graphic Log	GROUND WATER OBSERVATIONS		Sample Type	Recovery % RQD	TX Cone or Std. Pen. (blows/ft.in)	Pocket Penetrometer (tsf)	Unconfined Comp. Strength (tsf)	% Passing No. 200 Sieve	Unit Dry Weight (pcf)	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
		▽ On Rods (ft): <u>21</u>	▼ After Drilling (ft): <u>Dry</u>											
MATERIAL DESCRIPTION														
0 - 2.0		Brown CLAY with sand and gravel-FILL	2.0				4.5+							
2.0 - 5.0		Dark Brown CLAY					4.5+				21			
5.0 - 6.0			6.0				4.5+				25			
6.0 - 10.0		Tan and Gray CLAY					3.5				21			
10.0 - 13.0			13.0				4.0				31			
13.0 - 15.0		Tan and Gray SHALY CLAY					4.5+				32	79	30	49
15.0 - 20.0		-gray below 18'	20.0				4.5+				15			
20.0 - 25.0		▽ Gray SHALE												
25.0 - 30.0							100/ 5.75"							
30.0 - 35.0							100/ 5							
35.0 - 40.0							100/ 5							
40.0 - 45.0							100/ 6"							
45.0 - 50.0							100/ 4.75"							
50.0 - 55.0							100/ 5.25"							
55.0 - 60.0							100/ 3.5"							
60.0 - 65.0		-3" thick layer limestone seam					100/ 3.5"							
65.0 - 70.0							100/ 4.25"							
70.0 - 75.0		TEST BORING TERMINATED AT 70 FT	70.0				100/ 4.5"							

Client: DCO Realty, Inc.
Project: Vitruvian Park - Buildings 201, 202 and 203
Start Date: 10/7/2015 End Date: 10/7/2015
Drilling Method: CONTINUOUS FLIGHT AUGER

Location: Addison, Texas
Surface Elevation: _____
West: _____
North: _____
Hammer Drop (lbs / in): 170 / 24

Depth, feet	Graphic Log	GROUND WATER OBSERVATIONS		Sample Type	Recovery % RQD	TX Cone or Std. Pen. (blows/ft.in)	Pocket Penetrometer (tsf)	Unconfined Comp. Strength (tsf)	% Passing No. 200 Sieve	Unit Dry Weight (pcf)	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
		▽ On Rods (ft):	None											
MATERIAL DESCRIPTION														
0 - 4.0		Dark Brown CLAY					3.5							
4.0 - 13.0		Tan and Gray CLAY					2.5	1.1		91	31			
13.0 - 15.0		Tan and Gray SHALY CLAY					2.0				31			
15.0 - 20.0		Tan and Gray SHALY CLAY					3.25				33			
20.0 - 20.0		TEST BORING TERMINATED AT 20 FT					4.5+				33	76	26	50
20.0 - 75.0							4.5+				25			

Client: DCO Realty, Inc.

Location: Addison, Texas

Project: Vitruvian Park - Buildings 201, 202 and 203

Surface Elevation: _____

Start Date: 10/8/2015 End Date: 10/8/2015

West: _____

Drilling Method: CONTINUOUS FLIGHT AUGER

North: _____

Hammer Drop (lbs / in): 170 / 24

Depth, feet	Graphic Log	GROUND WATER OBSERVATIONS		Sample Type	Recovery % RQD	TX Cone or Std. Pen. (blows/ft.in)	Pocket Penetrometer (tsf)	Unconfined Comp. Strength (tsf)	% Passing No. 200 Sieve	Unit Dry Weight (pcf)	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
		▽ On Rods (ft):	None											
MATERIAL DESCRIPTION														
0-1		Tan CLAY with rock fragments-FILL	2.0				4.5+							
1-5		Dark Brown CLAY					4.5+				23	69	23	46
5-6			6.0				4.5+				25			
6-8		Tan and Gray CLAY					3.0				23			
8-10		Tan and Gray SHALY CLAY					2.75				30			
10-15							4.5+				29			
15-20			20.0				4.5+							
20-75		TEST BORING TERMINATED AT 20 FT												

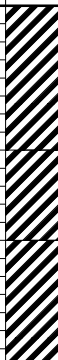
Client: DCO Realty, Inc.
Project: Vitruvian Park - Buildings 201, 202 and 203
Start Date: 10/8/2015 **End Date:** 10/8/2015
Drilling Method: CONTINUOUS FLIGHT AUGER

Location: Addison, Texas
Surface Elevation: _____
West: _____
North: _____
Hammer Drop (lbs / in): 170 / 24

Depth, feet	Graphic Log	GROUND WATER OBSERVATIONS		Sample Type	Recovery % RQD	TX Cone or Std. Pen. (blows/ft.in)	Pocket Penetrometer (tsf)	Unconfined Comp. Strength (tsf)	% Passing No. 200 Sieve	Unit Dry Weight (pcf)	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
		▽ On Rods (ft):	None											
MATERIAL DESCRIPTION														
0 - 2.0		2.0					4.5+							
2.0 - 5.0		5.0				100/ 3"								
5.0 - 8.0		8.0				100/ 2"								
8.0 - 11.0		11.0				100/ 3.5"								
11.0 - 15.0		15.0				100/ 1.5"								
15.0 - 20.0		20.0				91/ 10.75"								
20.0 - 75.0	TEST BORING TERMINATED AT 20 FT													



















Client: DCO Realty, Inc.
Project: Vitruvian Park - Buildings 201, 202 and 203
Start Date: 10/7/2015 **End Date:** 10/7/2015
Drilling Method: CONTINUOUS FLIGHT AUGER

Location: Addison, Texas
Surface Elevation: _____
West: _____
North: _____
Hammer Drop (lbs / in): 170 / 24






Depth, feet	Graphic Log	GROUND WATER OBSERVATIONS		Sample Type	Recovery % RQD	TX Cone or Std. Pen. (blows/ft.in)	Pocket Penetrometer (tsf)	Unconfined Comp. Strength (tsf)	% Passing No. 200 Sieve	Unit Dry Weight (pcf)	Water Content, %	Liquid Limit	Plastic Limit	Plasticity Index
		▽ On Rods (ft):	None											
MATERIAL DESCRIPTION														
5		Dark Brown CLAY					4.25				25	70	24	46
		-brown below 6'	8.0				2.5				25			
10		Tan and Gray CLAY					2.5				28			
				13.0			3.5				31			
15		Tan and Gray SHALY CLAY					4.25				29			
20			20.0			4.5+								
25		TEST BORING TERMINATED AT 20 FT												
30														
35														
40														
45														
50														
55														
60														
65														
70														
75														

**KEY TO SOIL SYMBOLS
AND CLASSIFICATIONS**

SOIL & ROCK SYMBOLS

	(CH), High Plasticity CLAY
	(CL), Low Plasticity CLAY
	(SC), CLAYEY SAND
	(SP), Poorly Graded SAND
	(SW), Well Graded SAND
	(SM), SILTY SAND
	(ML), SILT
	(MH), Elastic SILT
	LIMESTONE
	SHALE / MARL
	SANDSTONE
	(GP), Poorly Graded GRAVEL
	(GW), Well Graded GRAVEL
	(GC), CLAYEY GRAVEL
	(GM), SILTY GRAVEL
	(OL), ORGANIC SILT
	(OH), ORGANIC CLAY
	FILL

SAMPLING SYMBOLS

	SHELBY TUBE (3" OD except where noted otherwise)
	SPLIT SPOON (2" OD except where noted otherwise)
	AUGER SAMPLE
	TEXAS CONE PENETRATION
	ROCK CORE (2" ID except where noted otherwise)

RELATIVE DENSITY OF COHESIONLESS SOILS (blows/ft)

VERY LOOSE	0 TO 4
LOOSE	5 TO 10
MEDIUM	11 TO 30
DENSE	31 TO 50
VERY DENSE	OVER 50

SHEAR STRENGTH OF COHESIVE SOILS (tsf)

VERY SOFT	LESS THAN 0.25
SOFT	0.25 TO 0.50
FIRM	0.50 TO 1.00
STIFF	1.00 TO 2.00
VERY STIFF	2.00 TO 4.00
HARD	OVER 4.00

RELATIVE DEGREE OF PLASTICITY (PI)

LOW	4 TO 15
MEDIUM	16 TO 25
HIGH	26 TO 35
VERY HIGH	OVER 35

RELATIVE PROPORTIONS (%)

TRACE	1 TO 10
LITTLE	11 TO 20
SOME	21 TO 35
AND	36 TO 50

PARTICLE SIZE IDENTIFICATION (DIAMETER)

BOULDERS	8.0" OR LARGER
COBBLES	3.0" TO 8.0"
COARSE GRAVEL	0.75" TO 3.0"
FINE GRAVEL	5.0 mm TO 3.0"
COURSE SAND	2.0 mm TO 5.0 mm
MEDIUM SAND	0.4 mm TO 5.0 mm
FINE SAND	0.07 mm TO 0.4 mm
SILT	0.002 mm TO 0.07 mm
CLAY	LESS THAN 0.002 mm

TRANSMITTAL OF ADDENDUM

INSTRUCTIONS:

Acknowledge receipt of Addenda with the form below. Inclusion of this completed acknowledgement in final bid package is mandatory for bid acceptance.

Addendum Acknowledgment

I acknowledge the receipt of Addendum No.: 1 Total # of Pages: 9

Town of: Addison, Texas

Project Name: Vitruvian Park Public Infrastructure - Phase V

The undersigned bidder hereby certifies that Addendum No. 1 has been incorporated into the proposal and if accepted becomes part of the contract.

Company Name:

Flow-Line Construction, Inc.

Signed By (Print Name):

[Signature]

Signature:

Eduardo M. Hernandez

Date:

10/25/2016

Phone No:

214-390-2848

**PLEASE SIGN & INCLUDE THIS PAGE IN FINAL
BID PACKAGE**



16-184 VITRUVIAN PARK PUBLIC INFRASTRUCTURE – PHASE V
PRE-BID CONFERENCE 10/13/2016

Question 1. Who will be building temporary access crossings?

Answer: Building Contractor

Question 2. Will building contractor be responsible for paving after phase 1 has completed?

Answer: All paving is to occur in phase III. Acceptance of final paving inspection will be required upon completion of phase 3. Owner will be responsible for providing release to infrastructure contractor upon receipt of acceptance. UDR will be responsible for any paving repairs after acceptance by owner until completion of the corresponding building project.

Question 3. Is 180-day schedule flexible?

Answer: Yes – during pre-bid conference it was determined a new schedule of 270 calendar days would be acceptable, with an anticipated weekly schedule of Monday through Saturday in accordance with all town ordinances.

Question 4. Will there be an extra cost for required town inspections on Saturday?

Answer: No.

Question 5. Is there a requirement for construction forces?

Answer. No

Question 6. Will the Town provide water meters?

Answer: No. The Town has a list of acceptable suppliers.

Question 7. Where there is a requirement of Repair of Existing Irrigation System, is there an owner allowance for contingency of repairs, and/or a way to locate current irrigation systems (as-builts) and working conditions?

Answer. Irrigation systems are in good working order. There are no available as-builts for the irrigation system.

Question 8. Are duct bank plans approved by Oncor?

Answer: Yes.

CORPUS CHRISTI

5151 FLYNN PARKWAY, SUITE 500
CORPUS CHRISTI, TX 78411
361.400.2929

SAN ANTONIO

401 ISOM ROAD, SUITE 101
SAN ANTONIO, TX 78216
210.525.0647

DALLAS/FORT WORTH

16051 ADDISON ROAD, SUITE 211
ADDISON, TX 75001
210.468.4211



Question 9. Will there be any remedy if the building contractor causes delays to the infrastructure contractor?

Answer: Infrastructure contractor should coordinate with building contractor to ensure mitigation of delays.

Question 10. Will there be scheduling meetings with building contractor and owner?

Answer: Yes. It is anticipated that there will be weekly meetings held on site with all relevant parties.

Question 11. What material is footing of retaining wall exposed on the west side?

Answer: Not known.

Question 12. In areas not accessible to large paving equipment will slip form be allowed?

Answer: Yes.

Question 13. Does the parks department have a requirement to retain removed trees?

Answer: No.

Question 14. How many duplicates of bid are required?

Answer: 1 original, 2 copies and electronic copy (thumbdrive) are required. Electronic bidding on bidsyn.com will not be considered for this project.

Question 15. Duct bank questions including transformer size and package questions, Oncor acceptance of smaller bends.

Answer: There is only 1 transformer pad in this design and it is detailed in the design. Bid per design.

Question 16. Will the pre-bid conference sign-in sheet be available on bidsyn.com?

Answer: Yes.

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CURRENTLY UNANSWERED ON BIDSYN
As of 10/18/2016

Question 3. Who will be the Building Contractor on this project?

Answer: Clark Building Co. is anticipated to be the building contractor.

Question 4. What "control" of this site will the Utility Contractor have over the Building Contractor on this project? What remedies will be available if Building Contractor for example has the area we are working in obstructed or causes the Utility Contractor a delay? I understand we will need to coordinate with the Building Contractor but that doesn't always go smoothly.

Answer: The project construction manager will be over both projects and will resolve any and all conflicts.

Question 5. Note 21D on Plan Sheet 60 states flowable material may be used as select material around manholes when requested. Is this just at the discretion of the Town? Will flowable material be required around manholes? If so how will this be paid?

Answer: Compaction around manholes must be achieved. The use of flowable material is at the discretion of and for the benefit of the selected contractor. No additional funds will be provided for the use of flowable material.

Question 6. What is the anticipated date of mobilization on this project?

Answer: Mobilization will be required within 10 days of the issuance of the notice to proceed (NTP). NTP will be issued within 2 working days of Addison Town Council award of construction contract anticipated on November 14th 2016.

Question 7. Is there any flexibility on the 180 day schedule? This seems like a really tight schedule to complete this amount of work.

Answer: Yes – during pre-bid conference it was determined a new schedule of 270 calendar days would be acceptable, with an anticipated weekly schedule of Monday through Saturday in accordance with all town ordinances.

Question 8. Concerning bid item #24. Is this item meant to pay for all the excavation/grading and fill for all areas associated with paving from ROW to ROW?

Answer: Yes.

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Question 9. Concerning Sheet 8 note #17. Will there be a pay item for proof rolling?

Answer: No, this item is subsidiary.

Question 10. Concerning note #23 on sheet 8. This note states all earthwork will be considered unclassified excavation and bid on a lump sum basis. Bid item #24 looks to be for earthwork associated with paved areas. Where is the earthwork associated with unpaved/landscaped areas paid for and what is the anticipated quantity? There is no pay item for unclassified excavation outside of paved areas.

Answer: Bid item #24 is for all earthwork on this project. Note #23 is to notify the contractor that there will be no adjustment in quantity shown unless change in scope of work is approved.

Question 11. Per note #21 on sheet 8. This note says to strip 6" below grade for landscaped areas. Is there a bid item or estimated quantity for this work? Is this to be paid under bid item #176 (Prep of planting beds)?

Answer: No. Note #21 is a reference to mass grading and is included in bid item #24, unclassified excavation.

Question 12. Concerning bid item #24 quantities; Can you breakout how much is embankment or fill and how much is cut?

Answer: No, that is the responsibility of the contractor to verify.

Question 13. Can you provide cut plans for this project for the grading?

Answer: No, cut plans are unnecessary.

Question 14. Concerning bid item #33, constructing concrete street header. What is the depth of the header? Is stabilization required under street header?

Answer: Please reference detail provided on sheet #15. Stabilization will be required under the street header.

Question 15. Where will the dig out under the proposed sidewalks be paid for? What pay item will be used for base under the sidewalks?

Answer: Earthwork for sidewalks is subsidiary to sidewalk construction.

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Question 16. In the additive alternate section what pay items will cover the removal and subgrade for pay item #154 (concrete sidewalks)?

Answer: Earthwork for sidewalks is subsidiary to sidewalk construction.

Question 17. For bid item #147. Please confirm that this is for the Concrete Deepwell Pad only (Detail 205-345) and not to include the 4-Way 25kv Deadfront Switchgear Vista Vault (Detail 205-346) on plan sheet 70.

Answer: Detail 205-346 is not a vault detail. It is a detail for conduit locations for deep well pads only.

Question 18. For bid item 147. How many piers are required for the Concrete Deepwell Pad?

Answer: Four (4)

Question 19. Please confirm that it is not mandatory to bid the additive alternate bid portion of this package.

Answer: It is mandatory to bid the additive alternate bid portion but the Town of Addison reserves the right to not include this in the Award of Bid.

Question 20. Should the irrigation repair items be included in the base bid instead of the additive alternate bid? If the contractor decides not to be the additive alternate package how will the irrigation repair items be paid for?

Answer: Bid items 176, 177, and 178 should be moved to Base Bid as bid items 153, 154, and 155. Delete Additive Alternate Bid Items 174 (Connection to existing irrigation system mainline along Westgate Lane), and Bid Items 176, 177, and 178 (Repair of existing irrigation systems) in their entirety.

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16-184 VITRUVIAN PARK PUBLIC INFRASTRUCTURE – PHASE V
Miscellaneous Questions & Notifications

Question 1. Can the bid closing date be extended to allow additional time to incorporate RFI responses?

Answer: Yes, the bid closing date has been extended from Thursday, 10/20 to Tuesday 10/25 at 2:00pm CDT

Question 2. Do you have a detail for the asphalt pavement patch associated with the duct bank installation that runs through the parking lot on the NE corner of the project?

Answer: It is not a pavement patch. It is the Town of Addison's standard detail SD-U02 "Utility Asphalt Pavement Repair".

Notification 1: Irrigation Plan Sheets 86 and 87 have been revised.

CORPUS CHRISTI

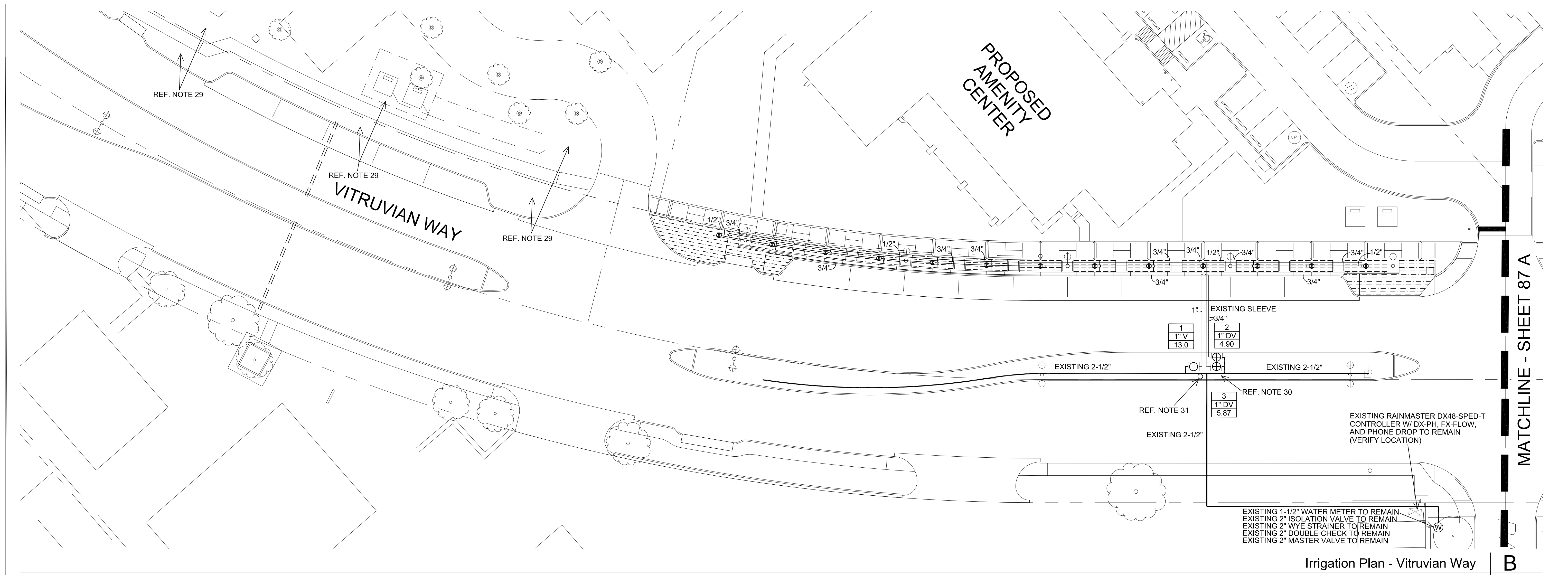
5151 FLYNN PARKWAY, SUITE 500
CORPUS CHRISTI, TX 78411
361.400.2929

SAN ANTONIO

401 ISOM ROAD, SUITE 101
SAN ANTONIO, TX 78216
210.525.0647

DALLAS/FORT WORTH

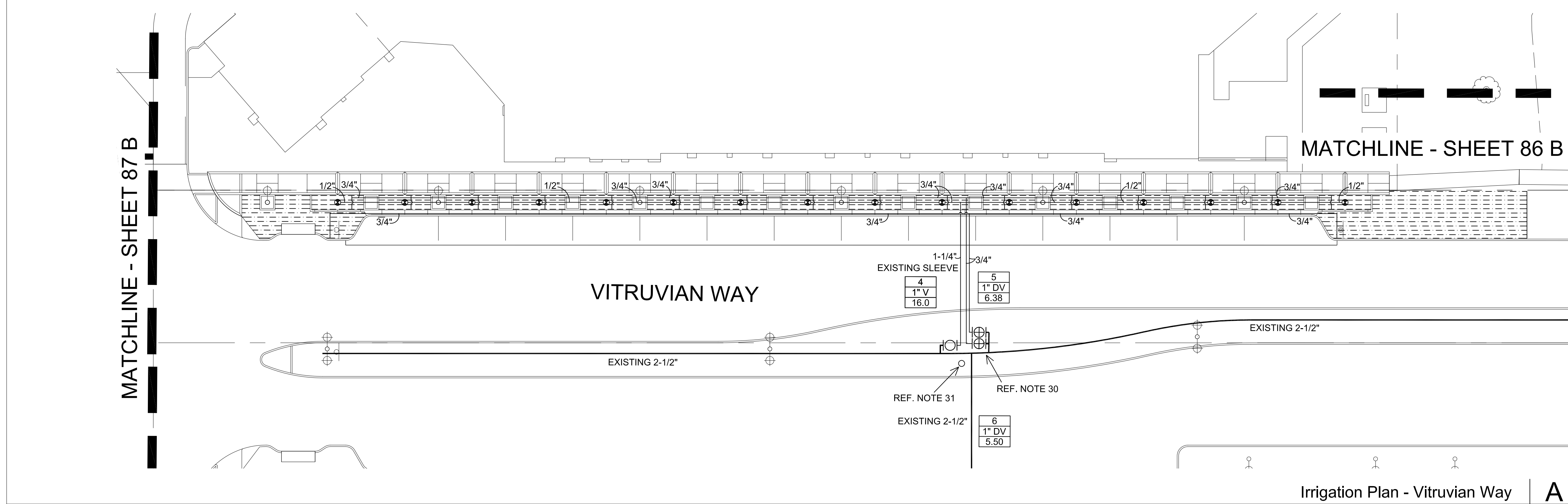
16051 ADDISON ROAD, SUITE 211
ADDISON, TX 75001
210.468.4211



MATCHLINE - SHEET 87 A

Irrigation Plan - Vitruvian Way

B



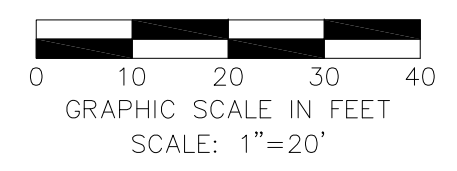
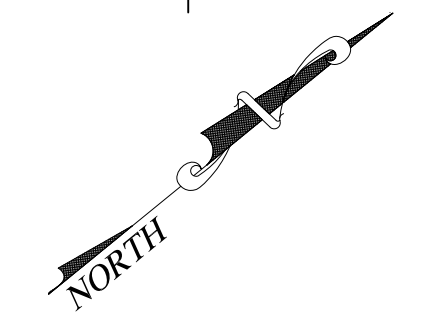
MATCHLINE - SHEET 87 B

MATCHLINE - SHEET 86 B

Irrigation Plan - Vitruvian Way

A

SETH A. HEIDMAN
 IRRIGATION DESIGN & CONSULTING, LLC
 10-13-2016



NO.	REVISION	BY	DATE

studioOutside

824 Exposition Avenue, Ste. 5
 Dallas, Texas 75226
 o214.954.7160
 f214.954.7162

PAVING, DRAINAGE & UTILITY IMPROVEMENTS

VITRUVIAN PARK PUBLIC INFRASTRUCTURE BLOCK 200

TOWN OF ADDISON, TEXAS

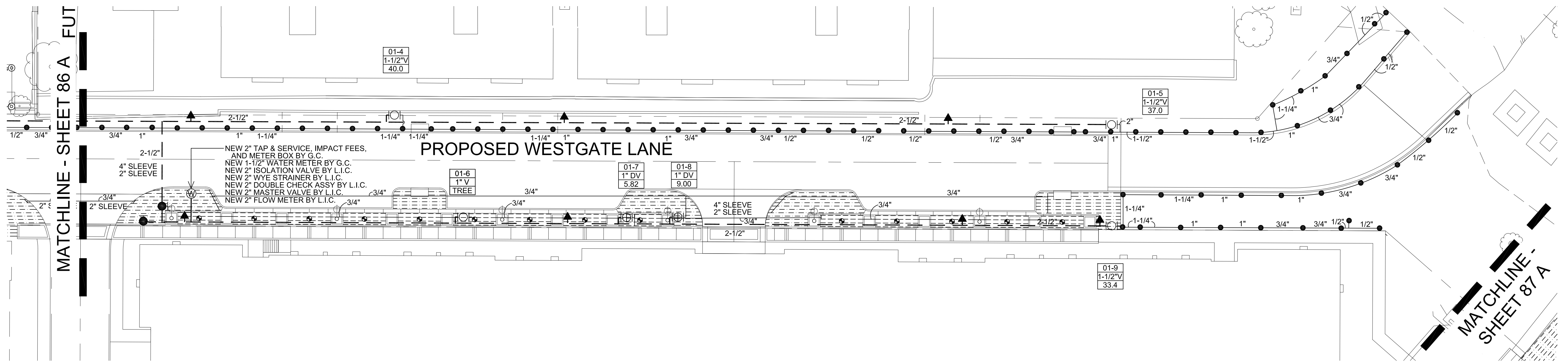
IRRIGATION PLAN
 VITRUVIAN WAY

DESIGN	DRAWN	DATE	SCALE	NOTES	Sheet No.
SAH	SAH	OCT 13, 2016	AS NOTED		87

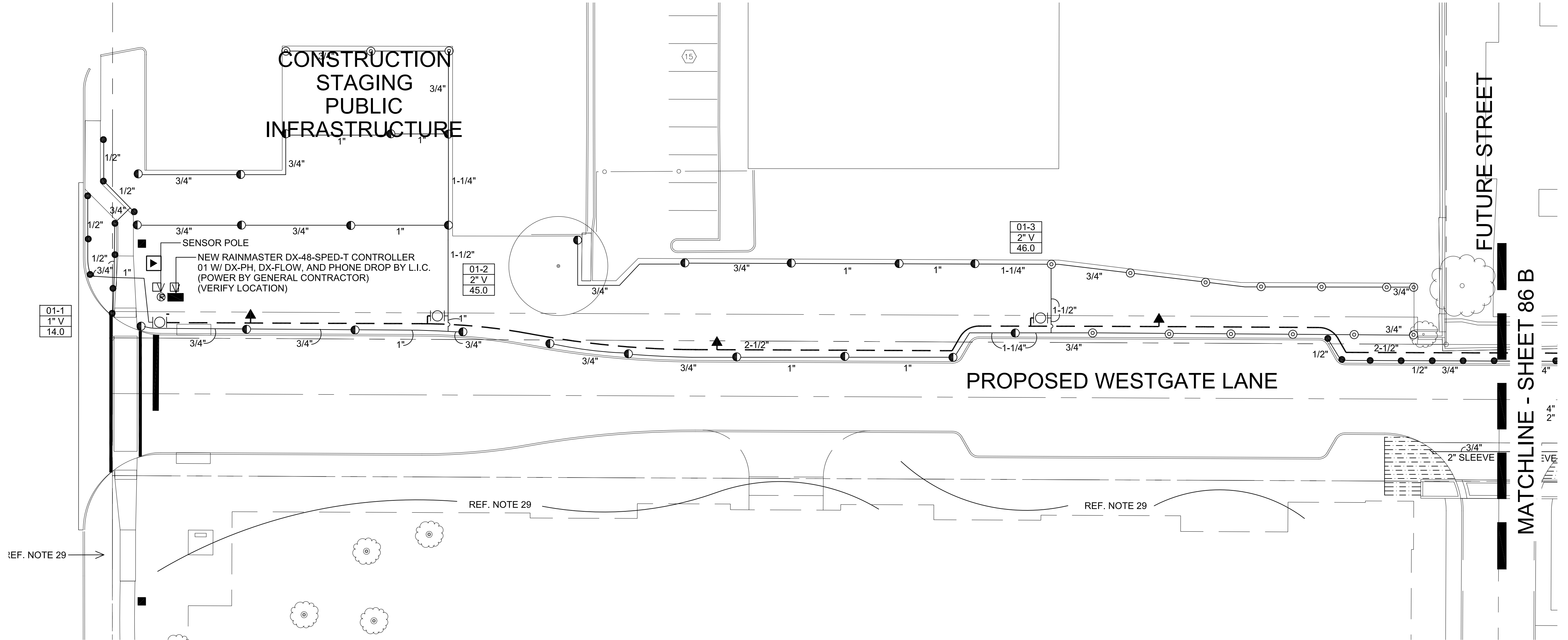
Scale: 1"=20'

Irrigation in Texas is regulated by the Texas Commission of Environmental Quality (TCEQ), MC-178, P.O. Box 13887, Austin, Texas, 78711-3887. TCEQ website is: www.tceq.texas.gov

VITRUVIAN PARK BLOCK 200 PUBLIC INFRASTRUCTURE - PROJECT NO. 16071



Irrigation Plan - Westgate Lane **B**
 Scale: 1"=20'



GRAPHIC SCALE IN FEET
 SCALE: 1"=20'

STATE OF TEXAS
 SETH A. HEIDMAN
 5881
 LICENSED IRRIGATOR
 10-13-2016

SETH HEIDMAN
 IRRIGATION DESIGN & CONSULTING, LLC
1000 W. PARKER RD. #100-201, FORT WORTH, TEXAS 76104

NO.	REVISION	BY	DATE

studioOutside
 824 Exposition Avenue, Ste. 5
 Dallas, Texas 75226
 o214.954.7160
 f214.954.7162

PAVING, DRAINAGE & UTILITY IMPROVEMENTS
 VITRUVIAN PARK PUBLIC INFRASTRUCTURE BLOCK 200
 TOWN OF ADDISON, TEXAS
IRRIGATION PLAN
 WESTGATE LANE

DESIGN	DRAWN	DATE	SCALE	NOTES	Sheet No.
SAH	SAH	OCT 13, 2016	AS NOTED		86

Irrigation Plan - Westgate Lane **A**
 Scale: 1"=20'

Irri... in Texas is regulated by the Texas Commission of Environmental Quality, 1400 North East Loop West, Austin, Texas, 78711-3867. P.L.D. No. 10-13-2016

VITRUVIAN PARK BLOCK 200 PUBLIC INFRASTRUCTURE - PROJECT NO. 16071