CONTRACT DOCUMENT & TECHNICAL SPECIFICATIONS

Contract No. 1

RIDGE ROAD LIFT STATION REHABILITATION

FOR THE

CITY OF PIGEON FORGE

Pigeon Forge, Sevier County, Tennessee

Tennessee Engineering Group

P.O. Box 6489

Sevierville, Tennessee 37864

November, 2017

TEG Project No. 17023

TABLE OF CONTENTS
CITY OF PIGEON FORGE
RIDGE ROAD LIFT STATION REHABILITATION

PAGE

INFORMATION FOR BIDDERS
SECTION 00010 – ADVERTISEMENT FOR BIDDERS 1
SECTION 00100 – INSTRUCTIONS TO BIDDERS 1-3
SECTION 00200 – INFORMATION AVAILABLE TO BIDDERS 1

BID FORMS
SECTION 00300 – BID FORMS 1-4
SECTION 00400 – SUPPLEMENTS TO BID FORMS 1-4

DIVISION 1 – GENERAL REQUIREMENTS

SECTION 01010 – SUMMARY 1
SECTION 01015 – WORK SEQUENCE 1
SECTION 01016 – OCCUPANCY 1
SECTION 01025 – MEASUREMENT AND PAYMENT 1-4
SECTION 01040 – COORDINATION 1
SECTION 01450 – QUALITY CONTROL 1
SECTION 01500 – TEMPORARY FACILITIES AND CONTROLS 1-3
SECTION 01530 – BARRIERS 1
SECTION 01540 – SECURITY 1
SECTION 01550 – ACCESS ROAD & PARKING AREAS 1
SECTION 01570 – TRAFFIC REGULATION 1-2
SECTION 01610 – TRANSPORTATION AND HANDLING 1
SECTION 01710 – CLEANING 1-3
SECTION 01720 – PROJECT RECORD DOCUMENTS 1-2

DIVISION 2 – SITE WORK

SECTION 02222 – EXCAVATION 1-2
SECTION 02226 – TRENCHING, BACKFILLING AND COMPACTING 1-3
SECTION 02270 – SLOPE PROTECTION AND EROSION CONTROL 1-5
SECTION 02310 – PIPE AND FITTINGS FOR SANITARY SEWERS 1-13
SECTION 02320 – CONNECTION TO EXISTING MANHOLES 1-2
SECTION 02330 – MANHOLES, FRAMES AND COVERS 1-7
SECTION 02350 – MAINTAINING WASTEWATER FLOW 1-3
SECTION 02500 – BITUMINOUS PAVEMENT 1-3
SECTION 02640 – VALVES 1-3
SECTION 02700 – SITE RESTORATION 1

DIVISION 3 – CONCRETE

SECTION 03600 – PRECISION GROUTING 1-4

DIVISION 5 – METALS

SECTION 05500 – METAL FABRICATIONS 1-4

INFORMATION FOR BIDDERS

TENNESSEE ENGINEERING GROUP

BIDDING AND CONTRACT REQUIREMENTS

SECTION 00010

PRE BID INFORMATION

Sealed bids for **"Contract No. 1 – Ridge Road Lift Station Rehabilitation"** for the City of Pigeon Forge, Tennessee, will be received at the Pigeon Forge Public Works Department in Pigeon Forge, 225 Pine Mountain Road, Pigeon Forge, Tennessee, 37868 until **2:00 P.M., Local Time, Friday, November 17, 2017** and then publicly opened and read aloud.

The program of work for which bids are to be submitted consists of labor and equipment required for the rehabilitation of the Ridge Road Lift station located on Ridge Road in Pigeon Forge, TN. including all related appurtenances as shown on the Drawings and described in the Specifications for the City of Pigeon Forge, Tennessee.

The Contract Time allotted for the completion of this Contract is fourteen (14) consecutive calendar days.

TENNESSEE ENGINEERING GROUP, P.O. Box 6489, Pigeon Forge, Tennessee 37864
Phone: (859) 351-9849.

City of Pigeon Forge, Tennessee, 225 Pine Mountain Road, Pigeon Forge, Tennessee 37868
Phone: (865) 429-7312

Copies of the Drawings, in full size and the Specifications and Contract Documents may be obtained from the City of Pigeon Forge, Pigeon Forge Public Works Department, 225 Pine Mountain Road, Pigeon Forge, Tennessee 37868, Phone (865) 429-7312.

All bids must be made on the required Bid Form and must be fully completed and executed with original signatures and corporate seals. All bidders must be listed as a plan holder by the plan distributor, the City of Pigeon Forge.

The contract is being funded by the City of Pigeon Forge.

Hearing impaired individuals may call 1-800-247-2510 for information.

No Bidder may withdraw his Bid within thirty (30) days after the actual date of bid opening.

Bidders on this work will be required to comply with Title VI of the Civil Rights Act of 1964, the Anti-Kickback Act, and the Contract Work Hours Standard Act.

Bidders must comply with the President's Executive Orders No. 11246 and No. 11375 and any amendments or supplements to those Executive Orders.

Attention of bidders is particularly called to the requirements as to conditions of employment to be observed under the contract, Section 3, Segregated Facility, Section 109 and E.O. 11246.

Bidders must certify they do not and will not maintain or provide for their employees any facilities that are segregated or based on race, color, creed, or national origin.

Bidders must comply with 41 CFR 60-4 in regard to affirmative action and to insure equal opportunity to females and minorities, and all that is applicable.

Minorities and small businesses are encouraged to submit bids on this project

The City of Pigeon Forge, reserves the right to waive any bidding informalities and to reject any or all bids, for any reason. The right is reserved by the Owner, in the exercise of its sole judgment to reject any or all Bids, and to re-advertise and award the Contract in the regular manner or to waive any informalities, irregularities, mistakes, errors, or omissions in any Bid received and to accept any Bid deemed to be responsive to this invitation and favorable to interests of the Owner.

The sealed bid for this project shall be clearly marked on the outside of the envelope: "Sealed Bid for **Contract No. 1 – Ridge Road Lift Station Rehabilitation"** for the City of Pigeon Forge, Tennessee. The bid must be delivered to: City of Pigeon Forge, Pigeon Forge Public Works Department, 225 Pine Mountain Road, Pigeon Forge, TN 37868.

City of Pigeon Forge, Tennessee
Mark Miller, Public Works Director

Date: November 13, 2017

SECTION 00100

INSTRUCTIONS TO BIDDERS

PART 1 - GENERAL INSTRUCTIONS AND INFORMATION

1.01 Each Bidder is responsible for inspecting the work site and for being thoroughly familiar with the Contract Documents, including Addenda. The Bidder shall in no way be relieved from any bidding obligation because of unfamiliarity with the site or documents. Neither the Owner nor Engineer assumes any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

1.02 All applicable laws, ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the Project shall apply throughout the Contract and they will be deemed to be included in the Contract the same as though herein written out in full.

1.03 The Owner of the Project is the City of Pigeon Forge, Tennessee.

1.04 The Engineer of the Project is Tennessee Engineering Group. P.O. Box 6489, Sevierville, Tennessee 37864, Phone: 859-351-9849, Mr. James C. Thompson, P.E. Project Engineer.

1.05 The Contract Documents contain the provisions for construction of the Project. Information obtained from an officer, agent, or employee of the Owner, or from any other person, shall not affect the risk or obligation assumed by the Contractor or relieves the Contractor from fulfilling any of the conditions of the Contract.

1.06 The Owner may make such investigations as deemed necessary to determine the ability of the Bidder to perform the Work, and the Bidder shall furnish to the Owner all such information and data for this purpose as the Owner may request. The Owner reserves the right to reject any Bid if the evidence submitted by, or an investigation of, such Bidder fails to satisfy the Owner that such Bidder is properly qualified to carry out the obligations of the Agreement and to complete the Work.

PART 2 - SPECIAL INSTRUCTIONS AND INFORMATION

The Contract will be awarded based on the lowest responsible bid, unless all bids are rejected. The Owner reserves the right to reject any and all Bids, to waive any and all informalities, to delete the whole or any part of the project, to negotiate contract terms with the successful bidder, and the right to disregard all non-conforming, non-responsive or conditional bids.

PART 3 - BIDDING PROCEDURE

3.01 Bids will be received by the City of Pigeon Forge at Pigeon Forge Public Works Department, 225 Pine Mountain Road, Pigeon Forge, Tennessee 37864, until **2:00 p.m., Local Time, Friday, November 17, 2017** and then publicly opened and read aloud at said office.

3.02 Each Bid must be submitted in a sealed envelope, addressed to City of Pigeon Forge, 225 Pine Mountain Road, Pigeon Forge, Tennessee 37868. Each envelope containing a Bid must be plainly marked on the outside as "Sealed Bid for City of Pigeon Forge - **"Contract No. 1 – Ridge Road Lift Station Rehabilitation"** and the envelope shall bear on the outside the Bidder's name, address and license number, if applicable, and date and time of opening. If forwarded by mail, the sealed envelope containing the Bid must be enclosed in another envelope addressed to City of Pigeon Forge, 225 Pine Mountain Road, Pigeon Forge, Tennessee 37868.

3.03 **BIDS MUST BE MADE ON THE REQUIRED BID FORM. EACH BIDDER SHALL COMPLETE THE ENTIRE BID FORM. THE ENTIRE BID FORM IS PRINTED ON YELLOW PAPER INCLUDED IN THIS DOCUMENT. THE BID SHALL BE SUBMITTED ON THE ORIGINAL YELLOW FORMS IN ORDER TO BE ACCEPTED. THE ENTIRE BID FORM CONSISTS OF ALL PAGES IN SECTIONS 00300 AND 00400.** All blank spaces for Bid prices must be filled in, in ink or typewritten, and the Bid form must be fully completed and executed when submitted. Each bid must be submitted on the prescribed form and accompanied by the required certificates. All foregoing certifications must be fully completed and executed when submitted.

3.04 A Bid may be withdrawn prior to the scheduled time for the opening of Bids, or authorized postponement thereof. A Bid received after the time and date specified will not be considered. No Bidder may withdraw a Bid within thirty (30) days after the actual date of the opening. Should the Contract not be awarded within the specified period, the time may be extended by mutual agreement between the Owner and the Bidder.

3.05 The Owner may consider informal any bid not prepared and submitted in accordance with the provisions hereof. The Owner may waive any bidding informalities or minor defects or reject any and all bids. Any bid may be withdrawn prior to the above scheduled time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered.

3.06 A conditional or qualified Bid will not be accepted. Bid proposals in which the Owner determines that the prices are unbalanced will not be accepted and may cause the bid to be rejected.

3.07 The Bidder shall supply the names and addresses of major suppliers and subcontractors as part of the Bid Proposal.

3.08 This contract is a lump sum bid.

3.09 The Owner reserves the right to add, delete or change any parts or portion of the proposed work. Any changes made by the Owner that affect the work will be compensated for.

3.10 Any bidder may modify his/her bid by telegraphic communication at any time prior to the scheduled closing time for receipt of bids, provided such telegraphic communication is received by the Owner prior to the closing time, and provided further, the Owner is satisfied that a written confirmation of the telegraphic modification over the signature of the bidder was mailed prior to the closing time. The telegraphic communication should not reveal the bid price but should provide the addition or subtraction or other modification so that the final prices or terms will not be known by the Owner until the bid is opened. If written confirmation is not received within two days from the closing time, no consideration will be given to the telegraphic modification.

3.11 Each bidder must inform themselves fully of the conditions relating to the construction of the project and the employment of labor thereon. Failure to do so will not relieve a successful bidder of his/her obligation to furnish all labor and equipment necessary to carry out the provisions of the contract. Insofar as possible, the contractor, in carrying out the work, must employ such methods or means as will not cause any interruption of or interference with the work of any other Contractor.

3.12 No interpretation of the meaning of the plans, specifications or other pre-bid documents will be made to any bidder orally.

Every request for such interpretation should be in writing addressed to Tennessee Engineering Group, P.O. Box 6489, Sevierville, Tennessee 37864, Mr. James C. Thompson, PE., Project Manager and to be given consideration must be received at least five days prior to the date fixed for the opening of bids. Any and all such interpretations and any supplemental instructions will be in the form of written addenda to the specifications which, if used, will be mailed to all prospective bidders (at the respective addresses furnished for such purposes), not later than three days prior to the date fixed for the opening of bids. Failure of any bidder to receive any such addendum or

interpretation shall not relieve such bidder from any obligation under his/her bid as submitted. All addenda so issued shall become part of the contract documents.

3.13 At the time of the opening of bids each bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the plans and Contract Documents (including all addenda). The failure or omission of any bidder to examine any form, instrument or document shall in no way relieve any bidder from any obligation in respect of his/her bid.

PART 4 - AWARD OF CONTRACT (AGREEMENT)

4.01 Award of Contract will be made to the lowest responsible Bidder for the Contract unless all Bids are rejected. The Owner reserves the right to reject any and all bids, to waive any bidding informalities, and to disregard all nonconforming, nonresponsive or conditional bids. Discrepancies between words and figures will be resolved in favor of words. Discrepancies between the indicated sum of any column of figures and the correct sum thereof will be resolved in favor of the correct sum.

4.02 The Bidder to whom the Contract is awarded will be issued a Purchase Order from the Owner and required to begin the work within ten (10) calendar days from the date of issuance.

4.03 The Purchase Order shall be issued by the Owner within ten (10) calendar days of the bid opening. Should there be reasons why the Purchase Order cannot be issued within such period, the time may be extended by mutual agreement between the Owner and Contractor. If the Purchase Order has not been issued within the specified periods or the period mutually agreed upon, the Contractor may terminate the Agreement without further liability on the part of either party.

- END OF SECTION -

SECTION 00200

INFORMATION AVAILABLE TO BIDDERS

PART 1 - INFORMATION AVAILABLE BUT NOT A PART OF CONTRACT DOCUMENTS.

1.01 The City has obtained all applicable permits and approvals.

- END OF SECTION -

BID FORMS

SECTION 00300

BID FORMS

PART 1 - BIDDER'S PROPOSAL FORM

BIDDER'S PROPOSAL

Contract No. 1 – Ridge Road Lift Station Rehabilitation

Proposal of _____ (hereinafter called "BIDDER"), organized and existing under the laws of the State of _____, doing business as _____ (insert "a corporation", "a partnership", or "an individual" as applicable). To the City of Pigeon Forge, Tennessee (hereinafter called "OWNER").

The undersigned BIDDER offers and agrees, if this Bid is accepted, to enter into an Agreement with OWNER in the form included in the Contract Documents to complete all Work as specified or indicated in the Contract Documents for the Contract Price and within the Contract Time indicated in the Agreement and in accordance with the Contract Documents.

BIDDER declares that no person or persons other than those named herein are interested in this Bid; or in any portion of the profit thereof. By submission of this Bid, the BIDDER certifies and in the case of a joint Bid each party thereto certifies as to its own organization, that this Bid has been arrived at independently without consultation, communication, or agreement as to any matter relating to this Bid, with any other Bidder, or with any competitor.

In submitting this Bid, BIDDER represents, as more fully set forth in the Agreement, that he has examined the Instructions to bidders, all of the other Bidding Documents and all of the Contract Documents; that he has examined the actual site and locality where the Work is to be performed; that he has familiarized himself with the legal requirements (federal, state and local laws, ordinances, rules and regulations); ;that he has made such independent investigations as he deems necessary; and that he has satisfied himself as to all conditions affecting cost, progress or performance of the Work.

BIDDER further agrees as follows: 1) that this Bid shall remain open and may not be withdrawn for the time period set forth in the Instructions to Bidders; 2) that he accepts all of the terms and conditions of the Instructions to Bidders; 3) and that, upon acceptance of this Bid, he will be issued a purchase order by the Owner for the work described in the contract documents.

In accordance with the above understanding and agreements and in compliance with the Advertisement for Bids, BIDDER hereby proposes to furnish all equipment, materials and labor for the work required to furnish all equipment and labor for the work required to construct the **"Contract No. 1 – Ridge Road Lift Station Rehabilitation"**– for the City of Pigeon Forge, in strict accordance with the Contract Documents, within the time set forth therein, and at the price stated below. Also, see Section 01025.

BID SCHEDULE

ITEM NO.	APPROX. QUANTITY	UNIT	DESCRIPTION	UNIT PRICE	TOTAL BID AMOUNT
1	1	LS	**Labor and Equipment for the Ridge Road Lift Station Rehabilitation,** Materials will be supplied by the Owner.		

AWARD OF CONTRACT NO. 1 – Ridge Road Lift Station Rehabilitation will be based on the lowest responsible, responsive Bidder on the TOTAL AMOUNT BID.

TOTAL AMOUNT BID:_____

Dollars and _____ **(Cents) ($**_____**)**

The above prices shall include all labor, materials, overhead, profit, insurance and other costs necessary to cover the finished work of the several kinds called for. The price per foot for pipe installation includes all labor, materials, unclassified excavation, rock blasting and removal, clean-up, etc. for a finished product.

By submission of this Bid, the BIDDER certifies, and in the case of a joint Bid each party thereto certifies as to its own organization, that this Bid has been arrived at independently, without consultation, communication, or agreement as to any matter relating to this Bid, with any other BIDDER or with any competitor.

TIME OF COMPLETION AND LIQUIDATED DAMAGES

The Time of Completion of the construction of this project is highly important to the OWNER. Should any CONTRACTOR neglect, refuse, or fail to complete his Contract within the Time of Completion specified herein, after giving effect to extensions of time if any, herein provided, then in that event and in view of the difficulty of estimating with exactness the full extent of damages to the OWNER caused by delays, the sums stated herein shall be assessed on the CONTRACTOR for each and every day his work is delayed in its completion beyond the specified Time of Completion and the amount of Liquidated Damages, plus such additional engineering and inspection expenses incurred by the Owner.

Contract completion times for the project are stated as follows and as described in the Advertisement for Bids:

DESCRIPTION OF WORK	CALENDAR DAYS FOR COMPLETION	LIQUIDATED DAMAGES PER DAY
"Contract No. 1 – Ridge Road Lift Station Rehabilitation"	14	$500.00

The Contract completion time stipulated above includes an allowance for an average number of inclement weather days as follows:

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOT
Precipitation	7	7	9	8	8	8	8	7	6	5	6	7	86
Freez. Temp.	10	6	1	0	0	0	0	0	0	0	1	5	23
Total	17	13	10	8	8	8	8	7	6	5	7	12	109

When number of days (including Saturdays, Sundays and Holidays) of Precipitation in excess of 0.1" per day or maximum daily temperature of 32 degrees F. exceed those shown above in any month, the CONTRACTOR shall be entitled to that number of additional days for contract completion.

If, in the ENGINEER'S opinion, sustained bad weather conditions prevent satisfactory performance of the work, he may suspend operations for an executed period until weather conditions are favorable. In this event, contract completion time shall be extended an equal number of days. Upon suspension of the work by the ENGINEER, the CONTRACTOR shall properly protect his work during the suspension period.

If the project is not completed within the specified time, the CONTRACTOR'S retainage may be used by the OWNER as one source of funds to compensate the ENGINEER for additional engineering services required because of time delays.

BIDDER acknowledges receipt of the following Addenda:

_____

_____

_____

_____

_____

BIDDER agrees that the OWNER reserves the right to delete the whole or any part of the Project from the Contract.

BIDDER understands that the OWNER reserves the right to reject any or all Bids and to waive any informalities in the Bidding.

BIDDER agrees that this Bid shall be good and may not be withdrawn for a period of thirty (30) calendar days after the actual date of bid opening.

BIDDER agrees to perform all of the Work described in the Specifications and shown on the Plans for the amount stated above.

BIDDER: _____

By _____

Title _____

Address _____

_____

Date Signed _____

(Seal - If bid is by a **corporation**)

If BIDDER IS

An Individual

By _____
(Individual's Signature)

Doing business as _____

License or Registration Number: _____

Business Address: _____

_____

_____

Phone No.: _____

By _____
(Firm Name)

Doing business as _____

License or Registration Number: _____

Business Address: _____

_____

Phone No.: _____

- END OF SECTION -

SECTION 00400

SUPPLEMENTS TO BID FORMS

ALL PARTS ARE REQUIRED TO BE COMPLETED AND MUST BE SUBMITTED WITH THE BID

PART 1 - BIDDER'S QUALIFICATIONS

A. The required names and addresses of all persons interested in the foregoing Bid, as Principals, are as follows:

_____

_____

_____

_____

_____

B. The Bidder shall submit the requested information indicated and for work of a similar character in size and total contract price that is included in the proposed Contract and references to enable the Owner to judge the Bidder's experience, skill and business standing.

1. Number of years in business as a contractor under present business name:

   _____

2. Number of years of experience in type of construction required for this project:

   _____

3. Have you ever been declared in default or failed to complete work awarded to you? If yes, where and why?_____

   _____

   _____

4. Have you ever been cited by a regulatory agency for failure to comply with any of its contractual obligations?_____. If yes, where and why? _____

   _____

   _____

5. List and age of owned equipment available for this project:_____

   _____

   _____

6. List similar project experience with references where the Bidder was the prime contractor and percent work completed as prime and percent completed by subcontractors.

Project Name	Description of Work	Date Completed	Contract Amount	% Prime/ % Subcontract	Owner/Contact	Phone No.
1.						
2.						
3.						
4.						
5.						

PART 2 – SUBCONTRACTORS

Proposed subcontractors are listed below for each branch of work included in the proposed Contract. All subcontractors are subject to the approval of the Owner. Failure to submit a completed list may be cause for rejection of the Bid. Experience of subcontractors shall be described on separate pages.

BRANCH OF WORK NAME AND ADDRESS OF SUBCONTRACTOR

_____ _____

(Other)

_____ _____

(Other)

(Add supplementary pages if necessary)

NOTES:

1. The OWNER in no way implies acceptance of any proposed subcontractor by acceptance of the Bid.
2. The CONTRACTOR will not be allowed to substitute subcontractors not listed herein without prior written approval of OWNER.

DEBARRED FIRMS

The undersigned hereby certifies that the firm of _____ has not and will not award a subcontract, in connection with any contract awarded to it as the result of this bid, to any firm that has been debarred for noncompliance with the Federal Labor Standards, Title VI of the Civil Rights Act of 1964, Executive Order 11246 as amended or any other Federal Law.

_____
(Name of Firm Submitting Bid)

_____
(Signature of Authorized Official)

Title_____

Date:_____

CERTIFIED COPY OF CORPORATE RESOLUTION

_____
(Name of Company)

I hereby certify that I am the duly elected and acting Secretary of _____

_____, a Corporation duly organized and existing under the laws of the State of _____; that on the _____ day of _____, 2017, the Board of Directors of said Corporation authorized and approved a certain Proposal to _____

_____(Insert Name of Owner) for the construction of certain improvements for _____ (Insert Name of Owner) by said Corporation and any contract resulting therefrom, and empowered the _____

_____ (Insert Title of Officer) of said Corporation to execute said Proposal and Contract for and in behalf of said Corporation; that said authority is not contrary to any provision in the Articles of Incorporation or code of regulations or code of bylaws of said Corporation; that said authority has not been rescinded or modified; and that _____ is the duly elected and acting _____ (Insert Title of Office) of said Corporation.

IN WITNESS WHEREOF, I have hereunto subscribed my name on _____, 2017.

_____

(Signature)

NONCOLLUSION AFFIDAVIT

State of _____)

County of _____)

Bid Identification
Contractor,
being first duly sworn, deposes and says that he is _____
_____(sole owner, a partner, president, secretary, etc.) of _____, the party making the foregoing bid; that such bid is not made in the interest of or on behalf of any undisclosed person, partnership, company, association, organization, or corporation; that such bid is genuine and not collusive or sham; that said bidder has not directly b or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that said bidder has not in any manner, directly or indirectly, sought by agreement, communication or conference with anyone to fix the bid price of said bidder or of any other bidder, or to fix any overhead, profit, or cost element of such bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract or anyone interested in the proposed contract; that all statements contained in such bid are true; and, further that said bidder has not, directly or indirectly, submitted his bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid and will not pay any fee in connection therewith, to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof, or to any other individual except to such person or persons as have a partnership or other financial interest with said bidder in his general business.

_____

SIGNED

_____

TITLE

Subscribed and sworn to before me this _____ DAY OF _____, 2017.

(SEAL)

_____

NOTARY PUBLIC

- END OF SECTION -

DIVISION 01

GENERAL REQUIREMENTS

SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The contract shall include but not be limited to the work described in these specifications

B. Project Identification: **"RIDGE ROAD LIFT STATION REHABILIATION"** for the City of Pigeon Forge, Tennessee.

C. Engineer: Tennessee Engineering Group, Sevierville, TN 37864

D. The following major Work items are included in the Contract:

1. Installation of pumps, guide rails, piping, valves and all other materials and equipment for a complete installation in the existing Ridge Road Lift Station.
2. The contractor will be responsible for any flow diversion, by-pass pumping required, cleanup, and all other items necessary for a complete installation as shown on the contract drawings and specifications.
3. All related appurtenances as shown on the Drawings and described in the Specifications.

E. The Contractor shall include all materials, labor and equipment necessary to complete all site work. The contract Documents are intended to provide the basis for completion of the work suitable for the intended use of the Owner. Anything not expressly set forth but which is reasonably implied or necessary for proper performance of the Project shall be included.

F. All work shall be in accordance with these Specifications and include all work necessary for a finished product.

G. All excavation is bid unclassified.

H. Continuous operations: The existing system must be maintained in continuous operation in such a manner that it meets all local, state, and federal requirements. The contractor is responsible not to deactivate, demolish, or interfere with any system component required for the continuous operation until a new or temporary permanent-like system has been installed and is operational. The Contractor is responsible for payment of all fines resulting from any action or inaction on his part or the part of his subcontractors during performance of the Work that causes the facility/facilities to operate in an illegal manner or fail to operate in a legal manner.

Use of Site: Limit use of site to public right-of-way. Do not disturb portions of project site beyond areas in which the Work is indicated.

1. Limits: Confine constructions operations to public right-of-way.
2. Driveways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

PART 2 – PRODUCTS - Not used.
PART 3 – EXECUTION - Not used.

- END OF SECTION -

SECTION 01015

WORK SEQUENCE

PART 1 - GENERAL

1.01 WORK INCLUDED

The Contractor shall submit to the Engineer for review and acceptance a complete schedule of his proposed sequence of construction operations prior to commencement of work. However, the Engineer shall not accept a construction schedule that fails to utilize the entire time allocated for the construction of the water system extension. This schedule requirement in no way prevents the Contractor from completing the project in a shorter time frame than scheduled. The construction schedule shall be submitted and approved by the Owner prior to the submittal of the first partial payment request. A revised construction schedule shall be submitted with every subsequent partial payment request. This revised schedule must be approved by the Owner prior to payment. The contractor shall use the following sequence of construction while working on the new water mains for the CITY OF PIGEON FORGE, CONTRACT 1 – RIDGE ROAD LIFT STATION REHABILITATION.

1. Locate all water mains, sewer mains and existing valves and make sure they are workable
2. Notify the City of Pigeon Forge a minimum of 48 hours prior to connecting into any existing line
3. Install new sewer main and lift station using extreme caution not to damage existing water lines or services and/or other utilities.
4. **Contractor is responsible for any repairs to the existing utilities and/or property during construction.**
5. **Contractor must maintain continuous sewer service, and will be responsible for any flow diversion and/or by-pass pumping during the construction period.**

1.02 RELATED WORK

A. Section 01010 - Summary of Work.

1.03 ADDITIONAL INFORMATION

Any delays caused by the Contractor shall be at his expense and at no cost to the Owner or Engineer.

- END OF SECTION -

SECTION 01016

OCCUPANCY

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Contractor shall be aware that after each major portion of the project is completed, the Contractor shall notify the Engineer that those specific operations are complete and prior to replacing that portion of the work into service shall request an interim inspection of the work to be returned to or placed into service.

B. The interim inspection requested by the Contractor shall not preclude or supersede the final inspection of the project or reduce the Contractor's responsibility for the completed portion prior to final acceptance of the work by the Owner.

C. The Contractor shall provide all necessary temporary controls and other items required for operation of all work placed into service prior to final acceptance as required. At such time as new controls, etc. are complete and functioning, the Contractor shall remove all temporary installed items.

- END OF SECTION -

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 - GENERAL

1.01 WORK INCLUDED

The Contractor shall furnish all necessary labor, machinery, tools, apparatus, equipment, materials, equipment, service, other necessary supplies and perform all work, including all excavation and backfilling (without additional compensation, except where specifically set out in these specifications) at the unit or lump sum prices for the following items.

1.02 PROGRESS AND PAYMENTS SCHEDULES

A. Within ten (10) days after the date of formal execution of the AGREEMENT, the Contractor shall prepare and submit to the Engineer, for approval, a construction schedule which depicts the Contractor's plan for completing the contract requirements and show work placement in dollars versus contract time. The Contractor's construction schedule must be approved by the Engineer before any payments will be made on this contract.

B. Within ten (10) days after the date of formal execution of the CONTRACT AGREEMENT, the Contractor shall prepare and submit to the Engineer, for approval, a periodic estimate which depicts the Contractor's cost for completing the contract requirements and show by major unit of the project work, the Contractor's dollar value for the material and the labor (two separate amounts) to be used as a basis for the periodic payments. The Contractor's periodic estimate must be approved by the Engineer before any payments will be made on this contract.

C. The Engineer's decision as to sufficiency and completeness of the Contractor's construction schedule and periodic estimate will be final.

D. The Contractor must make current, to the satisfaction of the Engineer, the construction schedule and periodic estimate each time he requests a payment on this contract.

E. The Contractor's construction schedule and periodic estimate must be maintained at the construction site available for inspection and shall be revised to incorporate approved change orders as they occur.

F. When the Contractor requests a payment on this contract, it must be on the approved periodic estimate and be current. Further, the current periodic estimate and construction schedule (both updated and revised) shall be submitted for review and approval by the Engineer before monthly payments will be made by the Owner. The Contractor shall submit six (6) current copies of each (periodic estimate and construction schedule) when requesting payment.

1.03 CONDITIONS FOR PAYMENT

A. The Owner will make payments for acceptable work in place and materials properly stored on-site. The value of payment shall be as established on the approved construction schedule and periodic estimate, EXCEPT the Owner will retain ten percent (10%) of the work in place and a percentage as hereinafter listed for items properly stored or untested.

B. No payment will be made for stored materials unless a proper invoice from the supplier is attached to the pay request. Further, no item whose value is less than $1,000 will be considered as stored materials for pay purposes.

C. Payment for pipeline items shall be limited to eighty percent (80%) of the bid price until the pipeline items have been tested and clean up has been completed and accepted by the Engineer.

D. Payment for equipment items shall be limited to eighty-five percent (85%) of their scheduled value (materials portion only) until they are set in place. Eighty-five percent (85%) for stored materials and equipment shall be contingent on proper on-site storage as recommended by the manufacturer or required by the Engineer.

E. Payment for equipment items set in place shall be limited to ninety percent (90%) of their scheduled value until they are ready for operation and have been certified by the manufacturer. Ninety percent (90%) payment for installed equipment shall be contingent on proper routine maintenance of the equipment in accordance with the manufacturer's recommendations.

F. Payment for equipment items set in place and ready for operation shall be limited to ninety-five percent (95%) of their scheduled value until all acceptance tests have been completed and the required manufacturer's pre-startup operator's training has been completed.

G. Payment for the labor portion of equipment items will be subject only to the degree of completeness and the appropriate retainage.

H. The retainage shall be an amount equal to 10% of said estimate. The retainage on the equipment items shall be 10% as defined hereinbefore.

I. If at any time thereafter when the progress of the WORK is not satisfactory or determine that the Contractor is not making satisfactory progress, additional amounts may be retained.

1.04 CLAIMS FOR EXTRA WORK

A. If the Contractor claims that any instructions by Drawings or otherwise involve extra cost, he shall give the Engineer written notice of said claim within ten (10) days after the receipt of such instructions and, in any event before proceeding to execute the work, stating clearly and in detail the basis of his claim or claims. No such claim shall be valid unless so made.

B. Claims for additional compensation for extra work, due to alleged errors in spot elevations, contour lines or bench marks, will not be recognized unless accompanied by certified survey data, made prior to the time the original ground was disturbed, clearly showing that errors exist which resulted, or would result, in handling more material or performing more work than would reasonably be estimated from the Drawings and topographical maps issued.

C. Any discrepancies which may be discovered between actual conditions and those represented by the topographical maps and Drawings shall at once be reported to the Engineer, and work shall not proceed, except at the Contractor's risk, until written instructions have been received by him from the Engineer.

D. If, on the basis of the available evidence, the Engineer determines that an adjustment of the Contract Price or time is justifiable, the procedure shall then be as provided herein for "Changes in the Work".

E. By execution of this Contract, the Contractor warrants that he has visited the site of the proposed work and fully acquainted himself with the conditions there existing relating to construction and labor, and that he fully understands the facilities, difficulties and restrictions attending the execution of the work under this Contract. The Contractor further warrants that he has thoroughly examined and is familiar with the Drawings, Specifications and all other documents comprising the Contract. The Contractor further warrants that by execution of this Contract his failure when he was bidding on this Contract to receive or examine any form, instrument or document, or to visit the site and acquaint himself with conditions there existing, in no way relieves him from any obligation under the Contract, and the Contractor agrees that the Owner

shall be justified in rejecting any claim based on facts regarding which he should have been on notice as a result thereof.

1.05 DETERMINATION OF THE VALUE OF EXTRA (ADDITIONAL) OR OMITTED WORK

A. The value of extra (additional) or omitted work shall be determined in one or more of the following ways:

1. On the basis of the actual cost of all the items of labor (including on-the-job supervision), materials and use of equipment, plus a maximum 20% for added work or a minimum 20% for deleted work which shall cover the Contractor's general supervision, overhead and profit. In case of subcontracts, the sum of total overhead amounts of the subcontractors and Contractor, plus total profit amounts for the subcontracts and Contractor shall not exceed 25% of the cost. Subcontractors shall be limited to 15% and Contractors shall be limited to 10% for combined overhead and profit. The cost of labor shall include required insurance, taxes and fringe benefits. Contractor to provide detailed breakdown of all cost as justification of change in work. Equipment costs shall be based on current rental rates in the areas where the work is being performed, but in no case shall such costs be greater than the current rates published by the Associated Equipment Distributors, Chicago, Illinois.

2. By estimate and acceptance in a lump sum.

3. By unit prices named in the Contract or subsequently agreed upon.

B. Provided, however, that the cost or estimated cost of all extra (additional) work shall be determined in advance of authorization by the Engineer and approved by the Owner.

C. All extra (additional) work shall be executed under the conditions of the original Contract. Any claim for extension of time shall be adjusted according to the proportionate increase or decrease in the final total cost of the work unless negotiated on another basis.

D. Except for over-runs in contract unit price items, no extra (additional) work shall be done except upon a written change Order from the Engineer, and no claim on the part of the Contractor for pay for extra (additional) work shall be recognized unless so ordered in writing by the Engineer.

PART 2 – PRODUCTS

2.01 RIDGE ROAD LIFT STATION REHABILITATION (BID ITEM No. 1)

A. Payment for the rehabilitation of the Ridge Road Lift Station will be made at the contract lump sum price, complete in place, which shall include compensation for furnishing labor and equipment required for the rehabilitation of the lift station. The City of Pigeon Forge will be furnishing all necessary materials and components including pumps, piping, valves, guide rails and all other necessary parts and materials. The contractor will be responsible for any flow diversion, by-pass pumping required, cleanup, and all other items necessary for a complete installation as shown on the contract drawings and specifications.

PART 3 - EXECUTION

3.01 PAY ITEMS

A. The pay items listed herein before refer to the items listed in the Bid Schedule and cover all of the pay items under the base bid for this contract.

B. Any and all other items of work listed in the specifications or shown on the Contract Drawings for this contract shall be considered incidental to and included in those pay items.

- END OF SECTION -

SECTION 01040

COORDINATION

PART 1 - GENERAL

1.01 COORDINATION OF THE WORK

The Contractor shall coordinate the work of all the crafts, trades and subcontractors engaged on the Work, and he shall have final responsibility as regards the schedule, workmanship and completeness of each and all parts of the Work.

All crafts, trades and subcontractors shall be made to cooperate with each other and with others as they may be involved in the installation of work which adjoins, incorporates, precedes or follows the work of another. It shall be the Contractor's responsibility to point out areas of cooperation prior to the execution of subcontract agreements and the assignment of the parts of the Work. Each craft, trade and subcontractor shall be made responsible to the Owner, for furnishing embedded items, giving directions for doing all cutting and fitting, making all provisions for accommodating the Work, and for protecting, patching, repairing and cleaning as required to satisfactorily perform the Work.

The Contractor shall be responsible for all cutting, digging and other action of his subcontractors and workmen. Where such action impairs the safety or function of any structure or component of the Project, the Contractor shall make such repairs, alterations and additions as will, in the opinion of the Engineer, bring said structure or component back to its original design condition at no additional cost to the Owner.

Each subcontractor is expected to be familiar with the General Requirements and all sections of the Detailed Specifications for all other trades and to study all Drawings applicable to his work to the end that complete coordination between trades will be affected. Each Contractor shall consult with the Engineer if conflicts exist on the Drawings.

- END OF SECTION -

SECTION 01450

QUALITY CONTROL

PART 1 - GENERAL

1.01 QUALITY CONTROL

A. Work of all crafts and trades shall be laid out to lines and elevations as established by the Contractor from the Drawings or from instructions by the Engineer.

B. Unless otherwise shown, all work shall be plumb and level, in straight lines and true planes, parallel or square to the established lines and levels. The Work shall be accurately measured and fitted to tolerance as established by the best practices of the crafts and trades involved, and shall be as required to fit all parts of the Work carefully and neatly together.

C. All equipment, materials and articles incorporated into the Work shall be new and of comparable quality as specified. All workmanship shall be first-class and shall be performed by mechanics skilled and regularly employed in their respective trades.

1.02 TESTS, INSPECTIONS, AND CERTIFICATIONS OF MATERIALS

A. Tests, inspections and certifications of materials, equipment, subcontractors or completed work, as required by the various sections of the Specifications shall be obtained by the Contractor and all costs shall be included in the Contract Price.

B. The Contractor shall submit to the Engineer the name of testing laboratory to be used.

C. Contractor shall deliver written notice to the Engineer at least 24 hours in advance of any inspections or tests to be made at the Project site. All inspections, tests, samples for water quality or other procedures requiring the Engineer to attest to be conducted in the field shall be done in the presence of the Engineer or his representative.

D. Certifications by independent testing laboratories may be by copy of the attestation(s) and shall give scientific procedures and results of tests. Certifications by persons having interest in the matter shall be by original attest properly sworn to and notarized.

- END OF SECTION -

SECTION 01500

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 DESCRIPTION

A. The Contractor shall make his own provisions for temporary electricity and water and maintain strict supervision of use of temporary utility services as follows:

1. Enforce compliance with applicable standards.

2. Enforce safety practices

3. Prevent abuse of services.

4. Pay all utility charges required.

1.02 REQUIREMENTS OF REGULATORY AGENCIES

A. The Contractor shall obtain and pay for all permits as required by governing authorities.

B. Obtain and pay for temporary easements required across property other than that of Owner or that is shown on the Contract Drawings.

C. The Contractor shall comply with applicable codes.

1.03 REMOVAL

A. The Contractor shall completely remove temporary materials, equipment, and offices upon completion of construction.

B. The Contractor shall repair damage caused by installation and restore to specified or original condition.

1.04 TEMPORARY LIGHTING

A. The Contractor shall furnish and install temporary lighting required for:

1. Construction needs.

2. Safe and adequate working conditions.

3. Public Safety.

4. Security lighting.

5. Temporary office and storage area lighting.

B. Service periods for safety lighting shall be as follows:

1. Within construction area: All times that authorized personnel are present.

2. Public areas: At all times.

C. Costs of Installation and Preparation: Contractor shall pay all installation, maintenance and removal costs of temporary lighting.

D. Maintenance of temporary lighting service (replacement of bulbs, etc.) shall be the sole responsibility of the General Contractor.

1.05 TEMPORARY WATER

The Contractor shall provide the water necessary for testing and disinfection. Water purchased from the owner for flushing and testing shall be paid for at the whole sale price by the contractor. The Contractor shall supply his own hoses, chlorine for disinfection, etc.

1.06 SANITARY FACILITIES

Contractor shall provide sanitary facilities as set forth in General Provisions (GP-2.04.Sanitary Regulations).

1.07 FIELD OFFICE (Office Trailer not Required for this Contract)

The Contractor shall make his own provisions for providing the electricity, telephone, gas, water, sewer, and other utilities to his office trailer that are required or as necessary for completion of the work.

The Contractor shall be responsible for all utility charges.

PART 2 - PRODUCTS

Not used.

PART 3 – EXECUTION

3.01 IMPLEMENTATION

B. The Contractor shall provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to storm drains, adjacent areas and walkways prior to the start of any site work.

C. Straw bale dikes, silt fencing and synthetic filter fabric shall be used as necessary to protect adjacent lands, surface waters, and vegetation to achieve environmental objectives.

D. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

E. Soil deposited on pavement by construction and other contractor vehicles shall be removed and the pavement swept as required.

F. Plan and execute construction by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.

G. Minimize amount of bare soil exposed at one time.

H. Provide temporary measures such as berms, dikes, drains, hay bales, gabions, etc., as directed by the Engineer so as to minimize siltation due to runoff.

I. Construct fill and waste areas by selective placement to avoid erosive exposed surface of silts or clays.

J. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

3.02 OPERATION AND MAINTENANCE

A. The Contractor shall inspect, repair, and maintain erosion and sediment control measures until final stabilization has been established.

3.03 REMOVAL OF FACILITIES

A. The Contractor shall remove the temporary facilities after final stabilization has been established. Used devices (including old straw bales) shall be disposed of as Construction & Demolition debris.

3.04 DUST CONTROL

A. Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

- END OF SECTION -

SECTION 01530

BARRIERS

PART 1 - GENERAL

1.01 WORK INCLUDED

Temporary Railing: Temporary railing shall be provided around open pits and other locations where needed, to prevent accidents or injury to persons.

1.02 COST

The Contractor shall pay all costs for temporary railing.

- END OF SECTION -

SECTION 01540

SECURITY

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provide barricades, lanterns and other such signs and signals as may be necessary to warn of the dangers in connection with open excavation and obstructions.

B. Provide an adequate and approved system to secure the Project area at all times, especially during non-construction periods; the Contractor shall be solely responsible for taking proper security measures.

1.02 COSTS

Contractor shall pay all costs for protection and security systems.

- END OF SECTION -

SECTION 01550

ACCESS ROADS AND PARKING AREAS

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Access roads.

B. Parking.

C. Existing pavements and parking areas.

D. Permanent pavements and parking areas.

E. Maintenance.

F. Removal, resurfacing.

PART 2 - PRODUCTS

2.01 MATERIALS

For temporary construction: Contractor's option.

PART 3 - EXECUTION

3.01 ACCESS ROADS

A. Construct temporary all-weather access roads from public thoroughfares to serve construction area, of a width and load-bearing capacity to provide unimpeded traffic for construction purposes.

B. Construct temporary bridges and/or culverts to span low areas and allow unimpeded drainage.

C. Extend and relocate as work progress requires, provide detours as necessary for unimpeded traffic flow.

D. Locate temporary access roads as approved by the Owner and/or the Engineer.

3.02 PARKING

The Contractor shall construct temporary parking areas to accommodate use of construction personnel in the area.

3.03 REMOVAL, REPAIR

A. Remove temporary materials and construction when permanent facilities are usable, as directed by the Engineer.

B. Repair existing permanent facilities damaged by usage to original and/or specified condition.

- END OF SECTION -

SECTION 01570

TRAFFIC REGULATION

PART 1 - GENERAL

1.01 REQUIREMENTS INCLUDED

A. Construction parking control.

B. Flagmen.

C. Flares and lights.

D. Haul routes.

E. Traffic signs and signals.

F. Removal.

1.02 RELATED REQUIREMENTS

A. Section 01530 - Barriers.

B. Section 01580 - Project Identification and Signs.

PART 2 - PRODUCTS

2.01 SIGNS, SIGNALS AND DEVICES

A. Post-mounted and wall-mounted traffic control and informational signs as specified and required by local jurisdictions.

B. Automatic Traffic Control Signals: As approved by local jurisdictions.

C. Traffic Cones and Drums, Flares and Lights: As approved by local jurisdictions.

D. Flagman Equipment: As required by local jurisdictions.

PART 3 - EXECUTION

3.01 CONSTRUCTION PARKING CONTROL

A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and Owner's operations.

B. Monitor parking of construction personnel's vehicles in existing facilities. Maintain vehicular access to and through parking areas.

C. Prevent parking on or adjacent to access roads or in non-designated areas.

3.02 TRAFFIC CONTROL

A. Whenever and wherever, in the Engineer's opinion, traffic is sufficiently congested or public safety is endangered, Contractor shall furnish uniformed officers to direct traffic and to keep traffic off the highway area affected by construction operations.

B. Contractor shall abide by City regulations governing utility construction work.

C. Traffic control shall be provided according to the Tennessee Department of Transportation (TDOT) Manual on Uniform Traffic Control Devices for Streets and Highways.

3.03 FLAGMEN

Provide trained and equipped flagmen to regulate traffic when construction operations or traffic encroach on public traffic lanes.

3.04 FLARES AND LIGHTS

Use flares and lights during hours of low visibility to delineate traffic lanes and to guide traffic.

3.05 HAUL ROUTES

A. Consult with authorities, establish public thoroughfares to be used for haul routes and site access.

B. Confine construction traffic to designated haul routes.

C. Provide traffic control at critical areas of haul routes to regulate traffic and minimize interference with public traffic.

3.06 TRAFFIC SIGNS AND SIGNALS

A. At approaches to site and on site, install appropriate signs at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.

B. Install and operate traffic control signals to direct and maintain orderly flow of traffic in areas under Contractor's control, and areas affected by Contractor's operations.

C. Relocate as work progresses, to maintain effective traffic control.

3.07 REMOVAL

Remove equipment and devices when no longer required. Repair damage caused by installation. Remove post settings to a depth of 2 feet.

- END OF SECTION -

SECTION 01610

TRANSPORTATION AND HANDLING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Handling and Distribution:

1. The Contractor shall handle, haul, and distribute all materials and all surplus materials on the different portions of the work, as necessary or required; shall provide suitable and adequate storage room for materials and equipment during the progress of the work, and be responsible for the protection, loss of, or damage to materials and equipment furnished by him, until the final completion and acceptance of the work.

2. Storage and demurrage charges by transportation companies and vendors shall be borne by the Contractor.

B. Storage of Materials and Equipment: All excavated materials and equipment to be incorporated in the work shall be placed so as not to injure any part of the work or the existing facilities and so that free access can be had at all times to all parts of the work and to all public utility installations in the vicinity of the work. Materials and equipment shall be kept neatly piled and compactly stored in such locations as will cause a minimum of inconvenience to public travel and adjoining owners, tenants and occupants.

- END OF SECTION -

SECTION 01710

CLEANING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. During its progress the work and the adjacent areas affected thereby shall be kept cleaned up and all rubbish, surplus materials, and unneeded construction equipment shall be removed and all damage repaired so that the public and property owners will be inconvenienced as little as possible.

B. Where material or debris has washed or flowed into or been placed in existing watercourses, ditches, gutters, drains, pipes, structures, by work done under this contract, or elsewhere during the course of the Contractor's operations, such material or debris shall be entirely removed and satisfactorily disposed of during the progress of the work, and the ditches, channels, drains, pipes, structures, and work, etc., shall, upon completion of the work, be left in a clean and neat condition.

C. On or before the completion of the work, the Contractor shall, unless otherwise especially directed or permitted in writing, tear down and remove all temporary buildings and structures built by him; shall remove all temporary works, tools, and machinery or other construction equipment furnished by him; shall remove, acceptably disinfect, and cover all organic matter and material containing organics in, under, and around privies, houses, and other buildings used by him; shall remove all rubbish from any grounds which he has occupied; and shall leave the roads and all parts of the premises and adjacent property affected by his operations in a neat and satisfactory condition.

D. The Contractor shall thoroughly clean all materials and equipment installed by him and his subcontractors, and on completion of the work shall deliver it undamaged and in fresh and new appearing condition.

E. The Contractor shall restore or replace, when and as directed, any public or private property damaged by his work, equipment, or employees, to a condition equal or better than that existing immediately prior to the beginning of operations. To this end the Contractor shall do as required all necessary highway or driveway, walk, and landscaping work. Suitable materials, equipment, and methods shall be used for such restoration. The restoration of existing property or structures shall be done as promptly as practicable as work progresses and shall not be left until the end of the contract period.

1.02 DESCRIPTION

A. Related Requirements Specified Elsewhere:

1. Project Closeout: Section 01700.

2. Cleaning for Specific Products or Work: Specification Section for that work.

B. On a continuous basis, maintain premises free from accumulations of waste, debris, and rubbish, caused by operations.

C. At completion of Work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all sight-exposed surfaces; leave Project clean and ready for occupancy.

1.03 SAFETY REQUIREMENTS

A. Hazards Control:

1. Store volatile wastes in covered metal containers, and remove from premises daily.

2. Prevent accumulation of wastes, which create hazardous conditions.

3. Provide adequate ventilation during use of volatile or noxious substances.

B. Conduct cleaning and disposal operations in compliance with local ordinances and anti-pollution laws.

1. Do not burn or bury rubbish and waste materials on Project site without written permission from the Owner.

2. Do not dispose of volatile wastes such as mineral spirits, oil, or fuel in open drainage ditches or storm or sanitary drains.

3. Do not dispose of wastes into streams or waterways.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Use only cleaning materials recommended by manufacturer of surface to be cleaned.

B. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

PART 3 - EXECUTION

3.01 DURING CONSTRUCTION

A. Execute cleaning to ensure that grounds and public properties are maintained free from accumulations of waste materials and rubbish.

B. Wet down dry materials and rubbish to minimize blowing dust.

C. At reasonable intervals during progress of Work, clean site and public properties, and dispose of waste materials, debris and rubbish.

D. Provide on-site containers for collection of waste materials, debris and rubbish.

E. Remove waste materials, debris and rubbish from site and legally dispose of at public or private dumping areas off construction site.

F. The Contractor shall thoroughly clean all materials and equipment installed.

3.02 FINAL CLEANING

A. Employ experienced workmen, or professional cleaners, for final cleaning.

B. In preparation for substantial completion, conduct final inspection of project area(s).

C. Broom clean paved surfaces; rake clean other surfaces of grounds.

D. Maintain cleaning until Project, or portion thereof, is accepted by Owner.

- END OF SECTION -

SECTION 01720

PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.01 WORK INCLUDED

The Contractor shall obtain from the Engineer, one (1) set of prints of the Contract Drawings. These prints shall be kept and maintained in good condition at the project site and a qualified representative of the Contractor shall enter upon these prints, from day-to-day, the actual "as-built" record of the construction progress. Entries and notations shall be made in a neat and legible manner and these prints shall be delivered to the Engineer upon completion of the construction. APPROVAL FOR FINAL PAYMENT WILL BE CONTINGENT UPON COMPLIANCE WITH THIS PROVISION.

1.02 RELATED REQUIREMENTS SPECIFIED ELSEWHERE:

A. Section 01300 - Submittals.

B. General Provisions

1.03 MAINTENANCE OF DOCUMENTS

A. Maintain at job site, one copy of:

1. Contract Drawings
2. Specifications
3. Addenda
4. Reviewed Shop Drawings
5. Change Orders
6. Other Modifications to Contract

B. Store documents in approved location, apart from documents used for construction.

C. Provide files and racks for storage of documents.

D. Maintain documents in clean, dry legible condition.

E. Do not use record documents for construction purposes.

F. Make documents available at all times for inspection by Engineer and Owner.

1.04 MARKING DEVICES

Provide colored pencil or felt-tip marking pen for all marking.

1.05 RECORDING

A. Label each document "PROJECT RECORD" in 2-inch high printed letters.

B. Keep record documents current.

C. Do not permanently conceal any work until required information has been recorded.

D. Contract Drawings: Legibly mark to record actual construction:

1. Horizontal and vertical location of underground utilities and appurtenances referenced to permanent surface improvements.

2. Location of internal utilities and appurtenances concealed in construction referenced to visible and accessible features of structure.

3. Field changes of dimension and detail.

4. Changes made by Change Order or Field Order.

5. Details not on original Contract Drawings.

E. Specifications and Addenda: Legibly mark up each Section to record:

1. Manufacturer, trade name, catalog number, and supplier of each product and item of equipment actually installed.

2. Changes made by Change Order or Field Order.

3. Other matters not originally specified.

F. Shop Drawings: Maintain as record documents; legibly annotate Shop Drawings to record changes made after review.

1.06 SUBMITTAL

A. At completion of project, deliver record documents to Engineer.

B. Accompany submittal with transmittal letter, in duplicate, containing:

1. Date.

2. Project Title and Number.

3. Contractor's Name and Address.

4. Title and Number of each Record Document.

5. Certification that each Document as Submitted is Complete and Accurate.

6. Signature of Contractor, or his authorized Representative.

- END OF SECTION -

DIVISION 02

SITE WORK

SECTION 02222

EXCAVATION

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Structure excavation.

B. Shoring excavations.

1.02 RELATED WORK

A. Section 01450 - Quality Control.

B. Section 02228 - Rock Removal.

C. Section 02211 - Rough Grading.

D. Section 02226 – Trenching, Backfilling and Embankments.

1.03 REGULATORY REQUIREMENTS

A. Protect excavations by shoring, bracing, sheet piling, underpining, or other methods required to prevent cave-in or loose soil from falling into excavation.

B. Underpin adjacent structures which may be damaged by excavation work, including service utilities and pipe chases.

C. Notify Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.

D. Protect bottom of excavations and soil adjacent to and beneath foundations from frost.

E. Grade excavation top perimeter to prevent surface water run-off into excavation.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Subsoil: Excavated material, graded free of lumps larger than 12 inches, rocks larger than 12 inches, and debris.

B. # 57's or # 9's: Mineral aggregate graded 1/4 inch to 5/8 inch, free of soil, subsoil, clay, shale, or foreign matter.

PART 3 - EXECUTION

3.01 PREPARATION

Identify required liens, levels, contours, and datum.

3.02 EXCAVATION

A. Excavate subsoil required for structure foundations, construction operations, and other work. All excavation shall be unclassified excavation.

B. Contractor is responsible to adequately brace open cuts and protect workmen and equipment from cave-in.

C. Remove lumped subsoil, boulders, and rock up to 1/3 cu. yd., measured by volume. Remove larger material under Section 02228.

D. Correct unauthorized excavation at no cost to Owner.

E. Fill over-excavated areas under structure bearing surfaces in accordance with direction by Engineer.

F. Stockpile excavated material in area designated on site.

3.03 FIELD QUALITY CONTROL

Provide for visual inspection of rock surfaces under provisions of Section 01450.

- END OF SECTION -

SECTION 02226

TRENCHING, BACKFILLING AND COMPACTING

PART 1 GENERAL

1.01 SUMMARY

A. This Section includes excavation and backfill as required for pipe installation or other construction in the trench, and removal and disposal of water, in accordance with the applicable provisions of the Section entitled "Earthwork" unless modified herein.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.01 EXCAVATION

A. The trench excavation shall be located as shown on the Contract Drawings or as specified. Under ordinary conditions, excavation shall be by open cut from the ground surface. Where the depth of trench and soil conditions permit, tunneling may be required beneath cross walks, curbs, gutters, pavements, trees, driveways, railroad tracks and other surface structures. No additional compensation will be allowed for such tunneling over the price bid for open cut excavation of equivalent depths below the ground surface unless such tunnel excavation is specifically provided for in the Contract Documents.

B. Trenches shall be excavated to maintain the depths as shown on the Contract Drawings or as specified for the type of pipe to be installed.

C. The alignment and depth shall be determined and maintained by the use of a string line installed on batter boards above the trench, a double string line installed along side of the trench or a laser beam system.

D. The minimum width of trench excavation shall be 6-inches on each side of the pipe hub for 21-inch diameter pipe and smaller and 12-inches on each side of the pipe hub for 24-inch diameter pipe and larger.

E. Trenches shall not be opened for more than 300 feet in advance of pipe installation nor left unfilled for more than 100 feet in the rear of the installed pipe when work is in progress without the consent of the Engineer. Open trenches shall be protected and barricaded as required.

F. Bridging across open trenches shall be constructed and maintained where required.

3.02 SUBGRADE PREPARATION FOR PIPE

A. Where pipe is to be laid on undisturbed bottom of excavated trench, mechanical excavation shall not extend lower than the finished subgrade elevation at any point.

B. Where pipe is to be laid on special granular material the excavation below subgrade shall be to the depth specified or directed. The excavation below subgrade shall be refilled with special granular material as specified or directed, shall be deposited in layers not to exceed 6 inches and shall be thoroughly compacted prior to the preparation of pipe subgrade.

C. The subgrade shall be prepared by shaping with hand tools to the contour of the pipe barrel to allow for uniform and continuous bearing and support on solid undisturbed ground or embedment for the entire length of the pipe.

D. Pipe subgrade preparation shall be performed immediately prior to installing the pipe in the trench. Where bell holes are required they shall be made after the subgrade preparation is complete and shall be only of sufficient length to prevent any part of the bell from becoming in contact with the trench bottom and allowing space for joint assembly.

3.03 STORAGE OF MATERIALS

A. Traffic shall be maintained at all times in accordance with the applicable Highway Permits. Where no Highway Permit is required at least one-half of the street must be kept open for traffic.

B. Where conditions do not permit storage of materials adjacent to the trench, the material excavated from a length as may be required, shall be removed by the Contractor, at his cost and expense, as soon as excavated. The material subsequently excavated shall be used to refill the trench where the pipe had been built, provided it be of suitable character. The excess material shall be removed to locations selected and obtained by the Contractor.

1. The Contractor shall, at his cost and expense, bring back adequate amounts of satisfactory excavated materials as may be required to properly refill the trenches.

C. If directed by the Engineer, the Contractor shall refill trenches with select fill or other suitable materials and excess excavated materials shall be disposed of as spoil.

3.04 REMOVAL OF WATER AND DRAINAGE

A. The Contractor shall at all times provide and maintain proper and satisfactory means and devices for the removal of all water entering the trench, and shall remove all such water as fast as it may collect, in such manner as shall not interfere with the prosecution of the work.

B. The removal of water shall be in accordance with the Section entitled "Earthwork".

3.05 PIPE EMBEDMENT

A. All pipe shall be protected from lateral displacement and possible damage resulting from superimposed backfill loads, impact or unbalanced loading during backfilling operations by being adequately embedded in suitable pipe embedment material. To ensure adequate lateral and vertical stability of the installed pipe during pipe jointing and embedment operations, a sufficient amount of the pipe embedment material to hold the pipe in rigid alignment shall be uniformly deposited and thoroughly compacted on each side, and back of the bell, of each pipe as laid.

B. Concrete cradle and encasement of the class specified shall be installed where and as shown on the Contract Drawings or ordered by the Engineer. Before any concrete is placed, the pipe shall be securely blocked and braced to prevent movement or flotation. The concrete cradle or encasement shall extend the full width of the trench as excavated unless otherwise authorized by the Engineer. Where concrete is to be placed in a sheeted trench it shall be

poured directly against sheeting to be left in place or against a bond-breaker if the sheeting is to be removed.

C. Embedment materials placed above the centerline of the pipe or above the concrete cradle to a depth of 12 inches above the top of the pipe barrel shall be deposited in such manner as to not damage the pipe. Compaction shall be as required for the type of embedment being installed.

3.06 BACKFILL ABOVE EMBEDMENT

A. The remaining portion of the pipe trench above the embedment shall be refilled with suitable materials compacted as specified.

1. Where trenches are within the ditch-to-ditch limits of any street or road or within a driveway or sidewalk, or shall be under a structure, the trench shall be refilled in horizontal layers not more than 8 inches in thickness, and compacted to obtain 95% maximum density, and determined as set forth in the Section entitled "Earthwork".

2. Where trenches are in open fields or unimproved areas outside of the ditch limits of roads, the backfilling may be by placing the material in the trench and mounding the surface.

3. Hand tamping shall be required around buried utility lines or other subsurface features that could be damaged by mechanical compaction equipment.

B. Backfilling of trenches beneath, across or adjacent to drainage ditches and water courses shall be done in such a manner that water will not accumulate in unfilled or partially filled trenches and the backfill shall be protected from surface erosion by adequate means.

1. Where trenches cross waterways, the backfill surface exposed on the bottom and slopes thereof shall be protected by means of stone or concrete rip-rap or pavement.

C. All settlement of the backfill shall be refilled and compacted as it occurs.

D. Temporary pavement shall be placed as specified in the Section entitled "Restoration of Surfaces".

-END OF SECTION-

SECTION 02270

SLOPE PROTECTION AND EROSION CONTROL

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Contractor shall do all work and take all measures necessary to control soil erosion resulting from construction operations, shall prevent the flow of sediment from the construction site, and shall contain construction materials (including excavation and backfill) within his protected working area so as to prevent damage to adjacent property.

B. The Contractor shall not employ any construction method that violates a rule, regulation, guideline or procedure established by Federal, State or local agencies having jurisdiction over the environmental effects of construction. The Contractor shall be responsible for obtaining all associated permits.

C. Pollutants such as chemicals, fuels, lubricants, bitumen, raw sewage and other harmful waste shall not be discharged into or alongside of any body of water or into natural or man-made channels leading thereto.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Temporary Slope Protection and Erosion Control:

Bales may be hay or straw, and shall be reasonably clean and free of noxious weeds and deleterious materials. Filter fabric for sediment traps shall be of suitable materials acceptable to the Engineer.

B. Permanent Slope Protection and Erosion Control:

On slopes 2H:1V and steeper, and where shown on the drawings place Type A Dumped Rock Fill with a 24-inch minimum thickness over non-woven geotextile filter fabric.

PART 3 - EXECUTION

3.01 METHODS OF CONSTRUCTION

A. The Contractor shall use any of the acceptable methods necessary to control soil erosion and prevent the flow of sediment to the maximum extent possible. These methods shall include, but not be limited to, the use of water diversion structures, diversion ditches and settling basins.

B. Construction operations shall be restricted to the areas of work indicated on the Drawings and to the area which must be entered for the construction of temporary or permanent facilities. The Engineer has the authority to limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and fill operations and to direct the Contractor to provide immediate permanent or temporary pollution control measures to prevent contamination of the wetlands and adjacent watercourses. Such work may involve the construction of temporary berms, dikes, dams, sediment basins, slope drains, and use of temporary mulches, mats, or other control devices or methods as necessary to control erosion.

C. Excavated soil material shall not be placed adjacent to the wetlands or watercourses in a manner that will cause it to be washed away by high water or runoff. Earth berms or diversions shall be constructed to intercept and divert runoff water away from critical areas. Diversion outlets shall be stable or shall be stabilized by means acceptable to the Engineer. If for any reason construction materials are washed away during the course of construction, the Contractor shall remove those materials from the fouled areas as directed by the Engineer.

D. For work within easements, all materials used in construction such as excavation, backfill, roadway, and pipe bedding and equipment shall be kept within the limits of the easements.

E. The Contractor shall not pump silt-laden water from trenches or other excavations into the wetlands, or adjacent watercourses. Instead, silt-laden water from his excavations shall be discharged within areas surrounded by baled hay or into sediment traps to ensure that only sediment-free water is returned to the watercourses. Damage to vegetation by excessive watering or silt accumulation in the discharge area shall be avoided.

F. Prohibited construction procedures include, but are not limited to, the following:

1. Dumping of spoil material into any streams, wetlands, surface waters, or unspecified locations.

2. Indiscriminate, arbitrary, or capricious operation of equipment in wetlands or surface waters.

3. Pumping of silt-laden water from trenches or excavations into surface waters, or wetlands.

4. Damaging vegetation adjacent to or outside of the construction area limits.

5. Disposal of trees, brush, debris, paints, chemicals, asphalt products, concrete curing compounds, fuels, lubricants, insecticides, washwater from concrete trucks or hydroseeders, or any other pollutant in wetlands, surface waters, or unspecified locations.

6. Permanent or unauthorized alteration of the flow line of any stream.

7. Open burning of debris from the construction work.

G. Any temporary working roadways required shall be clean fill approved by the Engineer. In the event fill is used, the Contractor shall take every precaution to prevent the fill from mixing with native materials of the site. All such foreign fill materials shall be removed from the site following construction.

3.02 EROSION CHECKS

The Contractor shall furnish and install baled hay or straw erosion checks in all locations indicated on the Drawings, surrounding the base of all deposits of stored excavated material outside of the disturbed area, and where indicated by the Engineer. Checks, where indicated on the Drawings, shall be installed immediately after the site is cleared and before trench excavation is begun at the location indicated. Checks located surrounding stored material shall be located approximately 6 ft. from that material. Bales shall be held in place with two 2 in. by 2 in. by 3 ft. wooden stakes. Each bale shall be butted tightly against the adjoining bale to preclude short circuiting of the erosion check.

- END OF SECTION -

SECTION 02310

PIPE AND FITTINGS FOR SANITARY SEWERS

PART 1 - GENERAL

1.01 WORK INCLUDED

The Contractor shall furnish all labor, material, and equipment necessary to install gravity and pressure sewer piping together with all appurtenances as shown and detailed on the Drawings and specified herein. THE CONTRACTOR WILL BE PERMITTED TO LAY PIPE, AND MAKE SERVICE CONNECTIONS ONLY WHEN THE ENGINEER OR HIS REPRESENTATIVE IS PRESENT.

1.02 RELATED WORK

A. Section 02222 - Excavation.

B. Section 02226 – Trench, Backfilling and Compacting.

C. Section 02330 - Manholes, Frames and Covers.

1.03 REFERENCES

A. AWWA C104.

B. AWWA C111.

C. AWWA C151.

D. ASTM C443.

E. ASTM C478.

F. ASTM D1785 and D1784.

G. ASTM D2467

H. ASTM D2564.

PART 2 - PRODUCTS

2.01 PIPE AND FITTINGS

A. Ductile Iron (DI) Pipe Gravity Sewers:

1. Ductile iron pipe shall conform to ANSI A21.50 (AWWA C150) and ANSI A21.51 (AWWA C151). The pipe shall be designed for an internal working pressure of 150 psi and external loading based on flat bottom trenches without blocks and untamped backfill laying conditions. The pipe shall conform to the minimum pressure class: of 150 psi.

2. Ductile iron fittings shall have a rating of 250 psi in accordance with ANSI A 21.10 (AWWA C 110).

3. Joints shall be push-on type, or mechanical joint type conforming to ANSI A21.11 (AWWA C 111) or type. Unless specifically required at designated locations by the Drawings, the type of joint used is optional.

   a. Push-on joints shall have an annular recess in the pipe socket to accommodate a single rubber gasket. Plain ends shall be suitably beveled to permit easy entry into the bell. The gasket and annular recess of the socket shall be so designed and shaped that the gasket is located in place against displacement as the joint is assembled.

   b. Mechanical joints shall be bolted and of the stuffing box type and shall consist of a bell with exterior flange and interior recess for the sealing gasket, a pipe or fitting plain end, a sealing gasket, a follower gland, tee-head bolts and hexagon nuts.

4. All ductile iron pipe and fittings shall have the manufacturer's outside coal tar or asphaltic base coating and a polyethylene lining complying with ANSI/ASTM D1248 on the inside.

5. The inside lining material for pipe and fittings shall be virgin polyethylene complying with ANSI/ASTM D1248, compounded with an inert filler and with sufficient carbon black to resist ultra-violet rays during aboveground storage of the pipe and fittings. The polyethylene shall be bonded to the interior of the pipe of fitting by heat.

   All surface areas to be lined shall be blast cleaned comparable to the requirements of SSPC-SP6 or NACE #3.

   Polyethylene linings shall cover the inner surface of pipe and fittings as shown and described below. In pipe utilizing push-on gaskets, the lining shall extend from the spigot end through the socket to the edge of the gasket sealing area. In mechanical joint pipe the lining shall extend from the spigot end through the socket to the edge of the gauging ring. The lining in fittings shall cover the interior surfaces including the socket areas as defined above.

   Lining in piping and in the fittings shall be 40 mils nominal thickness. Minimum lining thickness shall be 30 mils.

6. Pipe shall be furnished in lengths of 16, 16.5, 18 and 20 feet nominal laying lengths. The weight of any single pipe shall not be less than the tabulated weight by more than 5 percent for pipe 12 inches or smaller in diameter, not by more than 4 percent for pipe larger than 12 inches in diameter.

7. The net weight, class or nominal thickness and sampling period shall be marked on each pipe. The pipe shall also be marked to show that it is ductile iron.

B. Polyvinyl Chloride (PVC) Gravity Sewer:

1. Polyvinyl chloride (PVC) pipe and fittings, 4 to 15 inch in diameter, for gravity sewers shall conform to the requirements of ASTM specification D-3034 (SDR 35), current approval, "Type PSM Polyvinyl Chloride (PVC) Sewer Pipe and Fittings." Minimum pipe stiffness shall be 26.

2. Polyvinyl chloride (PVC) pipe and fittings, 18 inch to 27 inch in diameter shall conform to the requirements of ASTM specification F679, current approval.

3. Joints for PVC pipe shall be of the elastomeric gasket type and installed per the manufacturer's recommendations. Pipe that has been field cut must be beveled for insertion into gasketed joints. Bevel can be made with hand or power tool. In either case, the finished bevel should be the same as the factory bevel. All pipe shall be provided with home marks to insure proper gasket seating. Gasket material shall comply with the physical requirements specified in ASTM D-1869, C-361, C-433, current approval.

4. Fittings for service connections shall be of the factory made inline type conforming with the requirements of ASTM specification D-3034, current approval. Saddle type fittings shall not be used.

5. PVC sewer pipe shall be supplied in standard lengths of at least 12'6". Longer lengths are permitted.

6. PVC sewer pipe shall be marked with the manufacturer's name, production lot number, ASTM designation, PVC, and the nominal diameter.

7. All underground piping shall have a metallic tape laid 2 foot above the pipe. The tape shall have the word "Caution" printed on it and shall identify the pipe use. Product shall be Seton Name Plate Corp., New Haven, CT, No. 210, or equal.

8. Five copies of directions for handling and installation of pipe per the manufacturer's directions shall be furnished the Contractor at the first delivery of the pipe to the job.

2.02 HIGH-DENSITY POLYETHYLENE (HDPE) PIPE AND FITTINGS (GRAVITY SEWER)

A. HDPE pipe used in this project shall meet the following specifications.

1. ASTM D1248: Type III, Class B, Grade P34, Category 5.
2. PPI rating of PE 3408 when compounded.
3. ASTM D1693: melt flow, condition E, 5 g/10 min.
4. ASTM D2837-69: 1600 psi material, design basis.
   800 psi hydrostatic design stress.
5. ASTM D3350: minimum cell classification 34543D or E. For forcemains, 345434C.

B. The inner walls of the pipe shall be light in color so that television recording quality is fully enhanced.

C. HDPE fittings shall be molded or fabricated from a material meeting the same specifications as the pipe. Fittings shall be SDR 7 or as approved by the Engineer. Saddle-type fittings are not permitted.

D. HDPE fittings shall be of the compression type. The service connection shall be specifically designed for connection to the sewer main being installed and shall be Inserta Tee as manufactured by Inserta Fittings Co., or approved equal. Install using procedures and equipment as referenced in manufacturer's written installation instructions. All stainless steel shall be corrosion and rust proof. Parts shall meet the specifications listed below:

Types	Gasketed Bell SDR 35

PVC Hub		ASTM D3034 SDR 35
Gasket		ASTM F477
Band		301 SS
Screw		305 SS
Housing	301 SS	
Rubber Sleeve		ASTM C443

E. HDPE pipe shall be supplied in standard lengths of at least 12 ft.-6 in.. Longer lengths are permitted.

F. HDPE pipe shall be marked with the manufacturer's name, production lot number, ASTM designation, and nominal diameter.

G. The minimum wall thickness of HDPE pipe shall meet the following requirements.

Depth	Minimum SDR
0 to 16.0 ft	17
16.1 ft or deeper	13.5

2.03 PIPE JOINTING FOR HDPE PIPE

A. Jointing of HDPE pipe and fittings shall be by the butt thermal-fusion method and shall be performed in strict conformance with the pipe manufacturer's recommendations using approved equipment.

B. Joining of HDPE pipe to ductile iron pipe with mechanical joints shall be made with a flanged fitting. Special flanged fittings shall be manufactured to connect to the end flange on the HDPE pipe, so connection can then be made to the ductile iron pipe mechanical joints.

C. All joints shall be completely watertight, airtight and as strong as or stronger than the pipe wall, in strict accordance with the manufacturer's recommendations.

D. Where HDPE pipe is to be used in roadway crossing casings, the Contractor shall take precautions to insure no damage to the pipe when placing it into the casing.

2.04 PIPE JOINTING FOR DUCTILE IRON PIPE

Mechanical Joint:

A. Mechanical joints are to be furnished according to AWWA Specifications C111. All pipe joints must be furnished complete with all accessories. Mechanical joint bolts and nuts shall be of alloy cast iron (such as Acipcoloy) or alloy steel (Corten type such as US alloy) or approved equal. Rubber gaskets shall be made of plain first grade rubber, free of imperfections and porosity. Hardness shall be 70 to 75 durometer.

B. Mechanical joints shall be used where specifically called for on the Drawings.

C. Push-in socket joints shall be equal to manufacturer's specifications for "Tyton," "Bell-Tite," or "Fastite." The joints shall consist of a rubber ring gasket compressed in groove in bell of pipe with beveled spigot end of pipe for initial centering into rubber gasket in bell.

PART 3 - EXECUTION

3.01 SHORING, SHEETING, AND BRACING OF EXCAVATION

A. Where unstable material is encountered or where the depth of excavation in earth exceeds five (5) feet, the sides of the trench or excavation shall be supported by substantial sheeting, bracing, and shoring, or the sides sloped to the angle of repose. Sloping the sides of the ditch to the angle will not be permitted in streets, roads, narrow rights-of-way or other constricted areas unless otherwise specified. The design and installation of all sheeting, sheet piling, bracing and shoring shall be based on computations of pressure exerted by the materials to be retained under obtaining conditions. Adequate and proper shoring of all excavations shall be the entire responsibility of the Contractor; however, the Engineer may require the submission of shoring plans (accompanied by supporting computations) for approval prior to the Contractor undertaking any portion of the work. The standards of the Federal Occupational Safety and Health Act and the Kentucky Labor Cabinet shall be followed.

B. Foundations, adjacent to where the excavation is to be made below the depth of the existing foundation, shall be supported by shoring, bracing or underpinning as long as the excavation shall remain open, or thereafter if required to insure the stability of the structure supported by the foundation, and the Contractor shall be held strictly responsible for any damage to said foundations.

C. Solid sheeting will be required for wet or unstable material. It shall consist of continuous vertical sheet piling of timber or steel with suitable wales and braces.

D. Care shall be taken to avoid excessive backfill loads on the completed pipelines and the trench width requirements at the level of the crown of the pipe and at the level of a road or street be strictly observed.

E. Trench sheeting shall not be removed until sufficient backfill has been placed to protect the pipe.

F. All sheeting, planking, timbering, bracing and bridging shall be placed, renewed and maintained as long as is necessary.

3.02 PIPE BEDDING - GRAVITY SEWERS

A. All gravity sewer pipe shall be laid on a bed of granular material except when a concrete encasement situation occurs. All pipe bedding material shall be No. 9 crushed stone aggregate and shall be placed to a depth of 4" in an earth trench and 6" in a rock trench. The Contractor will not be permitted to use dense graded aggregate material for pipe bedding.

B. Pipe bedding shall be graded to provide for a uniform and continuous support beneath the pipe at all points.

C. After each pipe has been brought to grade, aligned, and placed in final position No. 9 crushed stone aggregate material shall be deposited and densified to a minimum density of 90% Standard Proctor per AASHTO T-99 under the pipe haunches and on each side of the pipe to the trench wall up to the spring line of the pipe to prevent lateral displacement and hold the pipe in proper position during subsequent pipe jointing, bedding, and backfilling operations.

D. In wet, yielding and mucky locations where pipe is in danger of sinking below grade or floating out of grade or line, or where backfill materials are of such a fluid nature that such movements of pipe might take place during the placing of the backfill, the pipe must be weighted or secured permanently in place by such means as will prove effective.

E. Where an unstable (i.e., water, mud, etc.) trench bottom is encountered, stabilization of the trench bottom is required. This is to be accomplished by undercutting the trench depth and replacing to grade with a foundation of crushed stone aggregate. The depth of the foundation is dependent upon the severity of the trench bottom. The size of stone aggregate used in the foundation will be determined by the condition of the unstable material. Once the trench bottom has been stabilized, the required No. 9 crushed stone aggregate bedding material can be placed. No compensation for Crushed Stone for Pipe Foundation will be made.

F. It should be noted that no pipe shall be laid on solid or blasted rock.

3.03 PIPE LAYING

A. The pipe shall be protected during handling against impact shocks and free fall. Care shall be taken to avoid dragging the spigot ring on the ground or allowing it to be damaged by contact with gravel, crushed stone, or other hard objects.

B. After being delivered alongside the trench, the pipe shall be carefully examined for soundness or damage. No piece of pipe or fitting which is known to be defective shall be laid or placed in the lines. If any defective pipe or fitting shall be discovered after the pipe is laid, it shall be removed and replaced with a satisfactory pipe or fitting without additional charge. Before each piece of pipe is lowered into the trench, it shall be thoroughly cleaned out. Each piece of pipe shall be lowered separately unless special permission is given otherwise by the Engineer. In case a length of pipe is cut to fit in a line, it shall be so cut as to leave a smooth end at right angles to the longitudinal axis of the pipe.

C. The bell and spigot of the joint shall be cleaned of dirt and foreign matter immediately prior to jointing. The contact surfaces shall be coated with the lubricant, primer or adhesive recommended by the pipe pushed together until the joint snaps distinctly in place. The pushing together of the pipe may be done by hand or by the use of a bar.

D. All pipe shall be laid straight between changes in alignment and at uniform grade between changes in grade. When jointed in the trench the pipe shall form a true and smooth line.

E. Trenches shall be kept dry during pipe laying. Before pipe laying is started, all water that may have collected in the trench shall be removed.

F. All pipe shall be laid starting at the lowest point and installed so that the spigot ends point in the direction of the flow.

3.04 PIPE BACKFILLING

A. Backfilling is defined as that material which is placed over the gravity sewer from the spring line to a predetermined point above the top of the pipe according to various backfilling situation as defined in Section C, this article. The material shall be No. 9 crushed stone aggregate and may be machine placed without compaction. Uneven places in the backfill shall be leveled by hand.

B. Final Backfill: There are four cases where the method of final backfilling varies. The various cases and trench situations are as follows:

1. Case I: Areas not subject to vehicular traffic.

2. Case II: Gravel areas subject to light vehicular traffic such as residential driveways; church and commercial parking lots and entrances; and farm drives.

3. Case III: City and County gravel roads; gravel and bituminous road shoulders; all bituminous surface areas such as City and County streets, residential driveways, church and commercial parking lots, and entrances; City and County road shoulders.

4. Case IV: State maintained streets and road; road shoulders for State roads and streets.

C. In all cases, walking or working on the completed pipeline, except as may be necessary in backfilling, will not be permitted until the trench has been backfield to a point 12 inches above the top of the pipe. The method of final backfilling for each of the above cases is as follows:

1. Case I - The trench shall be backfilled from a point 6"(12" for a rock trench) above the top of the pipe to a point 8" below the surface of the ground with earth material free from large rock over 0.3 cubic feet, acceptable to the Engineer. The remainder of the trench to existing grade shall be backfilled with earth material reasonably free of any rocks.

   Earth backfill used in this Case is not a separate pay item and is considered incidental to the work for the pay item "Sewer Main."

2. Case II - The trench shall be backfilled from a point 6" (12" for a rock trench) above the top of the pipe to a point 12" below the surface of the ground with Class I (No. 9 crushed stone aggregate) material. The trench shall be tamped to assure maximum possible compaction (approximately 80 to 85 percent of Standard Proctor density). Extreme care shall be exercised to prevent damage to the pipe during tamping operation. The remainder of the trench to existing grade shall be backfilled with Class II (dense graded aggregate) material with the material being mounded over the trench. The trench shall be tamped again to assure additional compaction. The trench may be left with a slight mound if permitted by the Engineer.

   Class I material used and method of backfilling used in this case is not a separate pay item and is considered incidental to the work for the item"Sewer Main."

   Class II material used in this method of backfill is not a separate pay item and is considered incidental to the work for the item "Sewer Main."

   Sufficient stockpiles of Class II material shall be placed throughout the project area to insure immediate replacement by the Contractor of any settled areas. The Contractor shall maintain the trench and replace or fill any settled areas until the section of main is accepted by the Owner. No extra payment will be made for the filling in of settled areas by the Contractor. Earth material shall not be used in this Case for backfill material.

3. Case III - The trench shall be backfilled from a point 6" (12" for a rock trench) above the top of pipe to the height indicated in the "City and County Maintained Streets, Roads and Driveway Pavement Replacement" detail with Class I (No. 9 crushed stone aggregate) material. Said material shall be tamped as described for Case II. A 12-inch layer of Class II (dense graded aggregate) material shall be placed over the compacted backfill before bituminous or concrete surface is placed as shown in the previously mentioned details. The 12-inch layer of Class II material is NOT a separate pay item but such expense will be borne by the Contractor and is considered incidental to the bid items "Bituminous or Concrete Surface Replacement". Also considered incidental is all temporary stone required for a temporary surface between backfilling and pavement replacement.

Sufficient stockpiles of Class II material shall be placed throughout the project area to insure immediate replacement by the Contractor of any settled areas. The Contractor shall maintain the trench and replace or fill any settled areas with crushed stone until the section of main is accepted by the Owner or until the final bituminous or concrete surface is placed over the trench. No extra payment will be made for the filling in of settled areas by the Contractor. Class II material used in this method of backfill is considered incidental and as a support item under the item "Bituminous Surface Replacement" or "Concrete Surface Replacement" at its unit price.

Class I material used for backfilling is not a separate pay item and is considered incidental to the bid item "Sewer Main."

4. Class IV- The trench shall be backfilled from the spring line to a point 1 foot above the top of the pipe with earth material free from rock and acceptable to the Engineer, it shall be carefully and solidly tamped by approved mechanical methods. The remainder of the trench shall be backfilled to the height indicated in the "State Maintained Streets and Roads Pavement Replacement Detail" in the Contract Drawings, with material free from rock and acceptable to the Engineer; said material shall be mechanically tamped in approximately 6 inch layers to obtain the maximum possible compaction. The backfilling method is NOT a separate pay item. A 12 inch layer of dense graded aggregate shall be placed over the compacted earth backfill when a bituminous or concrete surface street or road has been trenched. The 12 inch layer of stone is not a separate pay item but such expense will be borne by the Contractor.

D. Excavated materials from trenches and tunnels, in excess of quantity required for trench backfill, shall be disposed of by the Contractor. The Contractor may contact the Owner regarding the location of a suitable disposal site; however, if the Owner cannot recommend a site, it shall be the responsibility of the Contractor to obtain locations or permits for the disposal of the waste material. Unit prices for the various pipe sizes shall include the cost of disposing of excess excavated materials, as set forth herein, no additional compensation being allowed for hauling or overhaul.

3.05 CONNECTION TO EXISTING MANHOLES

A. The Contractor shall connect all proposed piping to existing PVC stubs or manhole walls. Connection to existing stubs must conform to the lines and grades as shown on the Plans. Connection to each existing manhole will be made with a waterproof elastomeric seal cast in the manhole wall as specified in Section 02330, Part 2.07.

B. All materials, accessories, and construction methods used in making the joints shall be supplied or approved by the manufacturer of the premolded elastomeric-sealed joint.

C. The Contractor shall furnish to the Engineer the manufacturer's written instructions for installation and certification that the product will perform satisfactorily under the conditions of the intended application prior to such installation.

D. Contractor shall construct a concrete cradle under each manhole connection as shown on the Drawings for a standard manhole.

3.06 SERVICE LATERALS

A. Low pressure air testing, deflection testing, bedding, and backfill, including compaction of materials shall be completed by the contractor and approved by the engineer or his representative, prior to connection of the service laterals to the main.

B. The contractor shall be responsible for providing temporary wastewater collection and disposal service as required. Discharges of sewage of any nature will not be permitted. Interruption of sanitary sewer service will not be permitted. The contractor will be permitted to dispose of collected sanitary sewage at the owner's wastewater treatment plant. The costs of providing temporary wastewater collection and disposal service including all labor, materials, and equipment, shall be included in the contract unit price for pipe.

C. The Contractor shall provide a new service wye, piping, fittings, and adapters necessary to construct a new service connection both horizontally and vertically as measured a minimum of 15 feet from the center line of the new main to the existing service lateral. The service wye, piping and fittings from the main to the point of service connection shall be low pressure air tested as defined in 3.06A above. All fittings, cleanouts, watertight plugs and accessories shall be as manufactured and furnished by the pipe supplier and have bell and spigot configurations compatible with that of the pipe. Connections to the existing service lateral shall be watertight, and are subject to testing requirements for pipe as specified hereinbefore if deemed necessary by the Engineer or his representative.

3.07 UTILITY CROSSING CONCRETE ENCASEMENT

A. At locations shown on the Contract Drawings, required by the Specifications, or as directed by the Engineer, concrete encasement shall be used when the clearance between the proposed sanitary sewer pipe or force main and any existing utility pipe is eighteen (18) inches or less. Utility pipe includes underground water, gas, telephone and electrical conduit, storm sewers, and any other pipe as determined by the Engineer.

B. There are two cases of utility crossing encasement. Case I is applicable when the proposed sanitary sewer line is below the existing utility line. Case II is applicable when the proposed sanitary sewer line is laid above the utility line. In either case, the concrete shall extend to at least the spring line of each pipe involved.

C. Concrete shall be Class B (3000 psi) and shall be mixed sufficiently wet to permit it to flow between the pipes to form a continuous bridge. In tamping the concrete, care shall be taken not to disturb the grade or line of either pipe or damage the joints.

D. Concrete is not a separate pay item and will be considered incidental to gravity sewer installation.

3.08 BITUMINOUS PAVEMENT REPLACEMENT

A. Sections of pavement shall be replaced as required to install the pipelines under the work of this Section. Disturbed pavement shall be reconstructed to original lines and grades with bituminous binder as detailed on the Drawings and in such manner as to leave all such surfaces in fully as good or better condition than that which existed prior to these operations.

B. Prior to trenching, the pavement shall be scored or cut to straight edges along each side of the proposed trench to avoid unnecessary damage to the remainder of the paving. Edges of the existing pavement shall be recut and trimmed as necessary to square, straight edges after the pipe has been installed and prior to placement of the binder course.

C. Backfilling of trenches shall be in accordance with the applicable portions of Section 02230.

D. Bituminous concrete binder shall be one course construction in accordance with applicable provisions of the Kentucky Department of Highways Standard Specifications, Section 402. Placement and compaction of binder course shall he in accordance with Section 402 of the

Tennessee Department of Transportation (TDOT) Standard Specifications. Minimum thickness after compaction shall be as shown on the Drawings.

3.09 CRUSHED STONE BACKFILL

A. The Class I granular material used in Case II and Case III backfill situations shall be No. 9 Crushed Stone aggregate (No. 9 Stone). Granular material will be paid for as a separate bid item.

B. The twelve inches (12") of crushed stone backfill that is required in "City and County Maintained Streets, Roads and Driveway Pavement Replacement" or "State Maintained Streets and Roads Pavement Replacement" will not be paid for under the provisions of this article.

3.10 CRUSHED STONE SURFACE REPLACEMENT

The Class II granular material used in Case II backfill situations shall be dense graded aggregate (D.G.A.). Granular material will be paid for at the unit price per linear foot under the pay item "Crushed Stone Surface Replacement".

3.11 TESTING OF GRAVITY SEWER LINES

A. After the gravity piping system has been brought to completion, and prior to final inspection, the contractor shall rod out the entire system by pushing through each individual line in the system, from manhole to manhole appropriate tools for the removal from the lines of any and all dirt, debris, and trash. If necessary during the process of rodding the system, water shall be turned into the system in such quantities to carry off the dirt, debris and trash.

B. During the final inspection, the Engineer will inspect each individual line, from manhole to manhole, either by use of lights, television or other means at his disposal to determine whether the completed lines are true to line and grade as laid out or as shown on the Drawings.

1. Deflection Test

   a. The Engineer may require deflection tests be performed on all flexible pipe. The test shall be conducted after the final backfill has been in place at least 30 days to permit stabilization of the soil-pipe system.

   b. No pipe shall exceed a deflection of 5 percent. If deflection exceeds 5 percent, replacement or correction shall be accomplished at the Contractor's expense.

   c. The rigid ball or mandrel used for the deflection test shall have a diameter not less than 95 percent of the base inside diameter or of the pipe. The pipe shall be measured in compliance with ASTM D 2122 Standard Test Method of Determining Dimensions of Thermoplastic Pipe and Fittings. The test shall be performed without mechanical pulling devices. The Contractor shall thoroughly clean the line prior to the deflection test.

2. The test shall be conducted as construction of the main progresses from manhole to manhole in accordance with Section 02310, Paragraph 3.06

3. All lines or sections of lines that are found to be laid improperly with respect to line or grade, that are found to contain broken or leaking sections of pipe, or are obstructed in such a manner that they cannot be satisfactorily corrected otherwise, shall be removed and replaced at the Contractor's expense.

C. The pipe line shall be made as nearly watertight as practicable, and leakage tests and measurements shall be made if required by the Engineer. The Contractor shall be responsible for providing temporary wastewater collection and disposal until a satisfactory leakage test is obtained. All apparatus and equipment required for testing shall be furnished by the Contractor and the cost shall be included in the unit price bid for pipe.

1. The Engineer may require the Contractor to smoke test the first section (manhole to manhole) of each size of pipe and type of joint prior to backfilling, to establish and check laying and jointing procedures. The test shall consist of smoke blown into closed-off sections of sewer under pressure and observing any smoke coming from the pipe line indicating the presence of leaks. Other supplementary smoke tests prior to backfilling may be performed by the Contractor at his option; however, any such tests shall not supplant the final tests of the completed work unless such final tests are waived by the Engineer.

2. Where the groundwater level is more than 1 foot above the top of the pipe at its upper end, the Contractor shall conduct either infiltration tests or low pressure air test on the completed pipeline.

3. Where the groundwater level is less than 1 foot above the top of the pipe at its upper end, the Contractor shall conduct either exfiltration tests or low pressure air tests on the completed pipeline.

D. Low pressure air tests shall be made using equipment specifically designed and manufactured for the purpose of testing sewer lines using low pressure air. The equipment shall be provided with an air regulator valve or air safety valve so set that the internal pressure in the pipeline cannot exceed 8 psig. The contractor will be required to conduct a low-pressure air test on the completed main and service connections before making the service connections and placing the line in service. Continuous sanitary sewer service shall be provided by the contractor.

1. The test shall be made on each manhole-to-manhole section of pipeline after placement of the backfill. The Engineer or his designated representative must be present to witness each satisfactory air test before it will be accepted as fulfilling the requirements of these specifications.

2. Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe to be tested. Pneumatic plugs shall resist internal test pressures without requiring external bracing or blocking.

3. Low pressure air passing through a single control panel, shall be introduced into the sealed line until the internal air pressure reaches 4 psig greater than the maximum pressure exerted by groundwater that may be above the invert of the pipe at the time of test. However, the internal air pressure in the sealed line shall not be allowed to exceed 8 psig. When the maximum pressure exerted by the groundwater is greater than 4 psig, the Contractor shall conduct only an infiltration test.

4. At least two minutes shall be allowed for the air pressure to stabilize in the section under test. After the stabilization period the low-pressure air supply hose shall be quickly disconnected from the control panel. The time required in minutes for the pressure in the section under test to decrease from 3.5 to 2.5 psig (greater than the maximum pressure exerted by groundwater that may be above the invert of the pipe) shall not be less than that shown in the following table:

Pipe in Diameter in Inches	Minutes
4	2.5
6	4.0
8	5.0
10	6.5
12	7.5
15	9.5

5. When the sewer section to be tested contains more than one size of pipe, the minimum allowable time shall be based on the largest diameter pipe in the section, and shall be the time shown in the table reduced by 0.5 minutes.

E. Infiltration tests shall be made after underdrains, if present, have been plugged and other groundwater drainage has been stopped such that the groundwater is permitted to return to its normal level insofar as practicable.

1. Upon completion of a section of the pipeline, the line shall be dewatered and a satisfactory test conducted to measure infiltration for at least 24 hours. The amount of infiltration, including pipe, manholes, tees and connections, shall not exceed 50 gallons per nominal inch diameter per mile of sewer per 24 hours.

2. The rate of leakage from the sewers shall be determined by measuring the amount of water required to maintain the level 2 feet above the top of the pipe.

F. Exfiltration tests which subject the pipeline to an internal pressure, shall be made by plugging the pipe at the lower end and then filling the line and manholes with clean water to a height of 2 feet above the top of the sewer at its upper end. Where conditions between manholes may result in test pressures which would cause leakage at the plugs or stoppers in branches, provisions shall be made by suitable ties, braces and wedges to secure the plugs against leakage resulting from the test pressure.

1. The rate of leakage from the sewers shall be determined by measuring the amount of water required to maintain the level 2 feet above the top of the pipe.

2. Leakage from the sewers under test shall not exceed the requirements for leakage into sewers as hereinbefore specified.

G. The Contractor shall furnish suitable test plugs, water pumps, and appurtenances, and all labor required to properly conduct the tests. Suitable bulkheads shall be installed, as required, to permit the test of the sewer. The Contractor shall construct weirs or other means of measurements as may be necessary.

H. Should the sections under test fail to meet the requirements, the Contractor shall do all work of locating and repairing the leaks and retesting as the Engineer may require without additional compensation.

I. If in the judgement of the Engineer, it is impracticable to follow the foregoing procedures for any reason, modifications in the procedures shall be made as required and as acceptable to the Engineer, but in any event, the Contractor shall be responsible for the ultimate tightness of the line within the above test requirements.

3.12 PLACEMENT OF IDENTIFICATION TAPE

A. The placement of detectable underground marking tape shall be installed over all utility lines. Care shall be taken to insure that the buried marking tape is not broken when installed and shall be Lineguard brand encased aluminum foil, Type III. The identification tape is manufactured by Lineguard, Inc., P. O. Box 426, Wheaton, IL 60187.

B. The identification tape shall bear the printed identification of the utility line below it, such as "CAUTION - BURIED SEWER LINE BELOW". Tape shall be reverse printed, surface printing will not be acceptable. The tape shall be visible in all types and colors of soil and provide maximum color contrast to the soil. The tape shall meet the APWA color code, and shall be two (2) inches in width. Colors are: yellow - gas, green - sewer, red - electric, blue - water, orange - telephone, brown - force main.

C. The tape shall be the last equipment installed in the ditch so as to be first out. The tape shall be buried 4 - 6 inches below top of grade. After trench backfilling, the tape shall be placed in the backfill and allowed to settle into place with the backfill. The tape may be plowed in after final settlement, installed with a tool during the trench backfilling process, unrolled before final restoration or installed in any other way acceptable to the Owner or his agent or Engineer.

- END OF SECTION -

SECTION 02320

CONNECTION TO EXISTING MANHOLES

PART 1 - GENERAL

1.01 SCOPE OF WORK:

Provide all labor, materials, equipment and services required to connect new sewer lines to existing manholes at locations shown on the drawings and/or specified herein.

1.02 SUBMITTALS:

A. Descriptive literature, catalog cuts, and dimensional prints clearly indicating all dimensions and materials of construction, shall be submitted on all items specified herein to the ENGINEER for review before ordering. Comply with provisions of Section 01010.

B. At the time of submission, the CONTRACTOR shall, in writing, call ENGINEER's attention to any deviations that the submittals may have from the requirements of the ENGINEER's Contract drawings and specifications.

PART 2 - PRODUCTS

2.01 CONNECTIONS TO EXISTING MANHOLES:

A. Whenever new sewers are connected to existing manholes, pipe openings shall be core drilled to accommodate new pipe. Round rubber gaskets (per Section 3410) shall be furnished and installed on the pipe at the position indicated as shown in the manufacturer's instructions, then the opening around the gasket shall be grouted to a watertight seal. Inside drops shall have all piping installed so as to discharge as close to the existing flow line as possible.

B. Existing manhole grouted inverts, flow lines, aprons, etc. shall be chipped out and re-grouted to accommodate the new piping.

C. Grout holes or damage in wall opening with Master Builders MASTERFLOW 713, SONOGROUT, or equal, non-shrink grout mixed to a damp packing or ramming consistency. Temporary backing or forming may be required for ramming the grout material in place around the pipe (and around the adapter in the case of plastic pipe). Place grout until flush with outside face of wall.

D. Prior to placing grout, coat the entire perimeter contact surface of the pipe hole with Sika Chemical Company SIKADUR HI-MOD, SONOBOND, or equal, moisture insensitive epoxy bonding compound. (Bonding compound eliminates moisture loss from fresh grout. No presoak is required). The epoxy-bonding compound must be tacky at the time grout is placed against it. Brushing over the original coating can restore tackiness.

E. Grout ring installation, mixing and placing grout and mixing and placing epoxy bonding compound shall all be accomplished in accordance with the respective manufacturer's instructions.

2.02 PUMPING AND BYPASING:

Provide all labor, materials, equipment and services required for pumping and bypassing sewage flows.

A. Flow through existing sanitary sewers and manholes shall not be interrupted, except as follows: flow may be interrupted long enough to reconfigure inverts in existing manholes or to core drill existing manholes, as necessary. Flow may also be interrupted to connect an existing sewer into a new sewer and to plug the outlet to be abandoned in the manhole. All situations requiring interruption of flows shall be carefully coordinated with the OWNER and ENGINEER at least three working days in advance. Anytime the flow through existing sanitary sewers or manholes is interrupted, the CONTRACTOR shall provide bypass pumping of the sewage to a truck or downstream manhole, as approved by the OWNER. Under no circumstances should sewage be allowed to surcharge new or existing sewers or manholes or to flow onto or into the ground. Length of bypass pumping shall be minimized as much as possible.

B. When pumping and bypassing is required, the CONTRACTOR shall supply the pumps, conduits, and other equipment to divert the flow of sewage around the sewer(s) or manhole(s) in which work is to be performed. The bypass system shall be of sufficient capacity to handle the same capacity as the sewer being bypassed, unless otherwise approved in writing by the ENGINEER. Pumps used for bypassing shall be capable of passing at least a 3" solid sphere, and bypass piping shall have a minimum size of 4" diameter. The CONTRACTOR will be responsible for furnishing the necessary labor and supervision to set up and operate the pumping and bypassing system. If pumping is required on a 24-hour basis, engines shall be equipped in a manner to keep noise to a minimum, and a spare back-up pump will be required. A spare back-up pump may be required at other locations or times as indicated in the construction documents. All fuel tanks for pump or generator motors shall be filled by the CONTRACTOR prior to leaving the job site if bypass pumping must continue. The CONTRACTOR will not suspend work for more than 24 hours during operation of a bypassing system, unless otherwise permitted by the ENGINEER.

Pumping and bypassing of sewage is <u>not</u> a pay item unless otherwise indicated on the proposal forms.

PART 3 - BASIS OF PAYMENT

Payment for connections made to existing manholes will be made at the contract unit price each for each connection made, complete in place, which price will include furnishing and installing all pipe excavation (including rock), all work and material required for making the connection all work and material required to re-work existing manhole inverts, bedding, backfilling and surface restoration (except pavement replacement).

END OF SECTION

SECTION 02330

MANHOLES, FRAMES AND COVERS

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Precast concrete sections.

B. Frames and covers.

1.02 STANDARD REFERENCES

A. ASTM C479-78.

B. ASTM C443-79.

C. ASTM C207-76.

D. ASTM C32-73.

1.03 DEFINITIONS

The following definitions cover the types of manholes used:

A. Standard Manhole: A standard manhole is defined as any manhole that is up to 6 feet in depth, as measured from the invert of the manhole base at its center to the bottom of the manhole frame.

B. Shallow Manhole: A shallow manhole is defined as any manhole that is less than 6 feet in depth, as measured in the preceding sentence.

C. Drop Manhole:

a. Where shown on the Drawings, the Contractor shall construct a drop manhole. The drop shall be constructed as shown on the detail in the Contract Drawings. The drop manhole shall be factory approved precast unit unless prior approval by the Engineer.

b. The drop connection piping shall be so encased in concrete that the tee and the pipe laid upstream of the connection shall be totally contained within the concrete.

c. A pipe shall be provided for a sewer entering a manhole at an elevation of 24 inches (610 mm) or more above the manhole invert. Where the difference in elevation between the incoming sewer and the manhole invert is less than 24 inches (610 mm), the invert shall be filleted to prevent solids deposition.

PART 2 - PRODUCTS

2.01 GENERAL

A. Manholes shall conform to shape, size, dimensions, materials, and other respects to the details indicated on the Drawings or bound in the Specifications.

B. All manholes shall have precast reinforced concrete developed bases. No other type of base will be allowed. Invert channels shall be factory constructed when the base is made. Sloping invert channels shall be constructed whenever the difference between the inlet and outlet elevation is two feet or less.

C. Manhole walls (barrels and cones) shall be precast concrete sections. The top of the cone shall be built of reinforced concrete adjustment rings to permit adjustment of the frame to meet the finished surface.

D. The inverts of the developed bases shall conform accurately to the size of the adjoining pipes. Side inverts shall be curved and main inverts (where direction changes) shall be laid out in smooth curves of the longest possible radius which is tangent, within the manhole, to the centerline of adjoining pipelines.

E. The cast-iron frames and covers shall be the standard frame and cover as indicated on the Drawings and specify hereinafter in this section.

F. All holes for pipe connections in barrels and bases shall have a factory-installed flexible rubber boot to prevent infiltration. The boot shall conform to the latest revision of A.S.T.M. C-443.

G. Excavation for manholes and other underground structures shall be of sufficient size to adequately accommodate installation and proper centering. The cost of excavation of these structures is to be included in the bid for excavation and backfill of the structure.

H. As relocation of manholes (from the original stake out) will change angles between pipe entering and leaving manholes so relocated, the Owner will not be responsible for manhole invert forms pre-built and non-usable as a result of relocations and subsequent angle change between pipes for any manhole beyond 1,000 feet ahead of the laying operation. Changes in angles of manhole inverts, caused by the relocation of a manhole after the original stakeout, shall be the responsibility of the Contractor if such relocation is necessitated by conflict with water, gas, or other utility or drain lines.

2.02 PRECAST CONCRETE SECTIONS

A. Precast concrete sections and appurtenances shall conform to the ASTM Standard Specifications for Precast Reinforced Concrete Manhole Sections, Designation C478, latest revision, with the following exceptions and additional requirements:

B. The wall sections shall be not less than 5 in. thick.

C. Type II cement shall be used except as otherwise permitted.

D. Joints between sections shall be made watertight through the use of O-ring gaskets or a 1-1/4" diameter flexible joint sealer, No. 2 Kent-Seal as manufactured by Hamilton Kent Manufacturing Company, "E-Z Stik" as manufactured by Concrete Products Supply Company, or approved equal. Gaskets shall conform to the A.S.T.M. Standard C-443, latest revision.

2.03 MORTAR FOR MASONRY UNITS

The mortar shall be composed of one part Portland cement and two parts of sand by volume with sufficient water to form a workable mixture. Cement shall be Type II Portland cement as specified for concrete masonry. The sand shall comply with the specifications for "Fine Aggregate" for concrete masonry except that all of the sand shall pass a No. 8 sieve, not more than 35 percent shall pass a No.50 sieve and conform to ASTM C-144.

2.04 MANHOLE FRAMES AND COVERS

A. The Contractor shall furnish all cast-iron manhole frames and covers conforming to the details shown on the Drawings, or as hereinbefore specified.

B. The castings shall be of good quality, strong, tough, even grained cast iron, smooth, free from scale, lumps, blisters, sandholes, and defects of every nature which would render them unfit for the service for which they are intended. Contact surfaces of covers and frame seats shall be machined to prevent rocking of covers.

C. All castings shall be thoroughly cleaned and subject to a careful hammer inspection.

D. Castings shall be at least Class 25 conforming to the ASTM Standard Specifications for Gray Iron Castings, Designation A48, latest revision.

E. Before being shipped from the foundry, castings shall be given one coat of coal-tar-pitch varnish, applied in a satisfactory manner so as to make a smooth coating, tough, tenacious, and not brittle or with any tendency to scale off.

F. Unless otherwise specified manhole covers shall be 22-3/4-in. in diameter, weighing not less than 400 pounds per frame and cover. Manhole covers shall set neatly in the rings, with contact edges machined for even bearing and tops flush with a ring edge. They shall have sufficient corrugations to prevent slipperiness. The covers shall have two pick holes about 1-1/4 inches wide and 2 inches deep with 3/8 inch undercut all around. Covers shall not be perforated. Frames and covers shall be as manufactured by J.R. Hoe and Sons, Neenah Foundry Company, or approved equal.

G. As indicated on the Contract Drawings and other locations as specified by the Owner or Engineer, watertight manhole frames with bolted lids shall weigh not less than 400 pounds per frame and cover, an overall diameter of 38 inches, height of 5-1/2 inches and clear opening of 22 inches. Four anchor bolt holes shall be provided to anchor to the precast concrete eccentric cone of the manhole. Lids shall be bolted to the frame with four bolts. All nuts, bolts and washers shall be stainless steel. The lids shall be the type with the bolts located on the outside edge of the lid and shall not be the type with the countersunk cap screws. Gaskets shall be a round neoprene type gaskets. Lids shall not be perforated. Frames and lids shall be as manufactured by J.R. Hoe and Sons, Neenah Foundry Company, or approved equal.

H. Where indicated on the Drawings, manhole covers shall be of the waterproof type and shall not leak when subjected to an internal pressure of 5 pounds per square inch. Bearing surfaces shall be machined and sealed with a rubber gasket. Waterproof manhole covers shall be fastened to the frame by countersank stainless a steel hexagonal-head cap screws. Covers shall be furnished with concealed pick holes.

I. All covers shall be marked in large letters "SANITARY SEWER" in the center.

2.05 STUBS IN MANHOLES

A. Stubs shall be at the locations indicated on the Drawings.

B. Polyvinyl chloride stubs shall be short pieces of PVC pipe with bell ends and plugs.

C. Stubs shall be set accurately to the required line and elevation and shall be installed in the manhole masonry as indicated on the Drawings.

2.06 PREMOLDED ELASTOMERIC-SEALED JOINTS

A. The Contractor may, as an alternate to suitable nonshrink mortar joints, use premolded elastomeric-sealed joints for pipe into precast manhole bases as indicated and as specified.

B. Premolded elastomeric-sealed joints shall be Lock Joint Flexible Manhole Sleeve made by Interpace Corp., Parsippany, N.J.; Kor-N-Seal made by National Pollution Control Systems, Inc., Nashua, N.H.; Press Wedge II made by Press-Seal Gasket Corp., Fort Wayne, Ind.; A-Lok Manhole Pipe Seal made by A-Lok Corp., Trenton, N.J.; or an acceptable equivalent product.

C. All materials, accessories, and construction methods used in making the joints shall be supplied or approved by the manufacturer of the premolded elastomeric-sealed joint.

D. The Contractor shall furnish to the Engineer the manufacturer's written instructions for installation prior to such installation.

E. Openings for pipe and materials to be embedded in the wall of the base for these joints shall be cast in the base at the required locations during the manufacture of the base.

PART 3 - EXECUTION

3.01 INSTALLATION - PRECAST SECTIONS

A. Manhole sections shall contain manhole steps accurately positioned and embedded in the concrete when the section is cast.

B. Sections shall be cured by subjecting them to thoroughly saturated steam at a temperature between 100 and 130 degrees F. for a period of not less than 12 hours or, when necessary, for such additional time as may be needed to enable the sections to meet the strength requirements.

C. No more than two lift holes may be cast or drilled in each section.

D. Flat slab tops shall have a thickness and reinforcement as indicated on the Drawings.

E. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the inside of the barrel.

F. Acceptance of the sections will be on the basis of material tests and inspection of the completed product.

G. Cones shall be precast sections of similar construction.

H. The tops of the bases shall be suitably shaped by means of accurate bell-ring forms to receive the barrel sections.

I. Top sections shall be precast eccentric conicals of similar construction of the other precast sections.

J. Where shown on the Drawings, drop manholes shall be constructed in accordance with the standard details.

3.02 SETTING PRECAST MANHOLE SECTIONS

A. Precast-reinforced concrete manhole sections shall be set so as to be vertical and with sections and steps in true alignment.

B. Rubber gaskets shall be installed in all joints in accordance with the manufacturer's recommendations.

C. All holes in sections used for their handling shall be thoroughly plugged with rubber plugs made specifically for this purpose or with mortar. The mortar shall be one part cement to 1-1/2 part=s sand, mixed slightly damp to the touch (just short of "balling"), hammered into the holes until it is dense and an excess of paste appears on the surface, and then finished smooth and flush with the adjoining surfaces.

3.03 SETTING MANHOLE FRAMES AND COVERS

A. Manhole frames shall be set with the tops conforming accurately to the grade of the pavement or finished ground surface or as indicated on the Drawings. Frames shall be set concentric with the top of the masonry and in a full bed of mortar so that the space between the top of the manhole masonry and the bottom flange of the frame shall be completely filled and made watertight. A thick ring of mortar extending to the outer edge of the masonry shall be placed all around and on the top of the bottom flange. The mortar shall be smoothly finished and have a slight slope to shed water away from the frame.

B. Watertight manhole frames shall be anchored to the eccentric cone of the manhole with four one-inch anchor bolts and of sufficient length to extend through any leveling rings which may be required.

C. Manhole covers shall be left in place in the frames on completion of other work at the manholes.

3.04 ADJUSTING MANHOLE FRAMES AND COVERS TO GRADE

A. Except where shown on the Drawings, the top of the precast concrete eccentric cone of a standard manhole or the top of the flat slab of a shallow manhole shall terminate 4" below existing grades in an unpaved non-traffic area other than in a residential yard and 13" below existing grades in a paved or unpaved traffic area and in a residential yard. The remainder of the manhole shall be adjusted to the required grade as described hereinafter in subparagraphs (B) and (C) of this article.

B. When a manhole is located in an unpaved non-traffic area other than in a residential yard, the frame and cover shall be adjusted to an elevation 3" to 5" above the existing grade at the center of the cover. If field changes have resulted in the installed manhole invert elevation to be lower than the invert elevation shown on the Drawings, the adjustment to an elevation of 3" to 5" above existing grade shall be accomplished by the use of precast concrete rings. If field changes have resulted in the completed manhole invert to be greater than the invert shown on the Drawings and the cover higher than 5" above existing grades, then the top of the eccentric cone, when used, or the top of the barrel section, when used, shall be trimmed down so that the

manhole cover, after installation, is no greater than 5" above existing grades at the center of the cover. The area around the adjusted frame and cover shall be filled with the required material, sloping it away from the cover at a grade of one-inch (1") per foot.

C. When a manhole is located in a bituminous, concrete, or crushed stone traffic area, or in a residential yard, the frame and cover shall be adjusted to the grade of the surrounding area by the use of precast concrete rings. The adjusted cover shall conform to the elevation and slope of the surrounding area. If field changes have resulted in the installed manhole invert elevation to be so much higher than the invert elevation shown on the Drawings that the top of the eccentric cone, when use, or the top of the flat slab, when used, is less than the thickness of the frame and cover (7") from the grade of the surrounding area, then the top of the cone or barrel section shall be trimmed down enough to permit the cover, after installation, to conform to the elevation and slope of the surrounding area.

3.05 LAYING GRADING RINGS

Only clean grading rings shall be used. Concrete masonry units shall be dry when laid. Each grading ring shall be laid in a full bed of mortar and shall be thoroughly bonded. Vertical keyways shall be completely filled with mortar.

3.06 COATING

The exterior surfaces of all manholes shall be given two heavy coats of bituminous waterproofing material. The material shall be No.-46-449 Heavy Duty Black made by Tnemec Company, Inc., North Kansas City, Mo.; No. 35-J-10 Hi-Build bituminous coating made by Mobil Chemical Company, Edison, N.J.; Bitumastic Super Service Black made by Koppers Company, Inc., Pittsburgh, Pa.; or acceptable equivalent products. The waterproofing material shall be applied by brush or spray and in accordance with the instructions of the manufacturer.

3.07 TESTING MANHOLES

All precast concrete manholes shall be vacuum tested to determine if they pass the infiltration/inflow requirements. The vacuum test shall be as follows:

1. The testing shall be done after assembly of the manhole and prior to backfilling.

2. The manhole-to-pipe connection shall be a flexible connector, such as the Kor-N-Seal or approved equal.

3. All lift holes shall be plugged with an approved non-shrinking mortar.

4. The seal between the manhole sections shall be in accordance with ASTM C923.

5. The Contractor shall plug the pipe openings, taking care to securely brace the plugs and the pipe. Stubouts, manhole boots and pipe plugs shall be secured to prevent movement while the vacuum is drawn.

6. The test head shall be placed at the inside of the cone section and the seal inflated. The compression band shall be inflated to 40 psi to effect a seal between the vacuum pump and the structure. Then connect the vacuum pump to the outlet port with the valve open and draw a vacuum to 10" of Hg. and close the valve.

7. With a measured vacuum of 10 inches of mercury established in the manhole, the time for the vacuum to drop to 9 inches of mercury shall be recorded.

Acceptance standards for leakage shall be from the elapsed time for a negative pressure change from 10 inches to 9 inches of mercury. The maximum allowable leakage rate for a four-foot diameter manhole shall be in accordance with the following:

Manhole depth	Minimum Elapsed Time for a Pressure Change of 1 Inch Hg
10 ft. or less	60 seconds
> 10 ft. < 15 ft.	75 seconds
> 15 ft. < 25 ft.	90 seconds

For manholes five feet in diameter, add an additional 15 seconds and for manholes six feet in diameter, add an additional 30 seconds to the time requirements for four-foot diameter manholes.

8. If the manhole fails the test, necessary repairs shall be made and the vacuum test and repairs shall be repeated until the manhole passes the test.

9. If a manhole joint mastic is completely pulled out during the vacuum test the manhole shall be disassembled and the mastic replaced.

-END OF SECTION-

SECTION 2350

MAINTAINING WASTEWATER FLOW

PART 1 - GENERAL

1.01 WORK INCLUDED

A. This Section shall include all pumps, hoses, tank trucks, traffic control, clean up, and any other materials required to effectively by-pass pump and maintain continuous wastewater flow in the existing sewer system.

B. The Contractor shall furnish all labor, materials, tools and equipment necessary to maintain wastewater flows in the sewer by means of by-pass pumping around the sewer segment or manhole to maintain flow continuously until rehabilitation work is completed.

PART 2 - PRODUCTS

Not used.

PART 3 - EXECUTION

3.01 CONSTRUCTION REQUIREMENTS

The Contractor shall contact the Engineer 48 hours in advance of any work related to wastewater flow control in existing systems. Procedures and equipment planned by the Contractor for maintaining wastewater flow during rehabilitation work shall be coordinated with the Engineer.

3.02 DEPTH OF FLOW

A. If the depth of flow in the existing sewer segment at a point upstream of the rehabilitation work is above the maximum allowable depth for television inspection, joint testing and/or sealing, flow shall be reduced to an acceptable level for lining or other rehabilitation by operation of pump station, plugging or blocking of the sewer, or by pumping and bypassing of flow as specified.

B. In performing television inspection, joint testing and/or sealing and other sewer rehabilitation work, the Contractor shall control the depth of flow in the sewer within the following guideline:

MAXIMUM PIPE FLOW DEPTH					
TELEVISION INSPECTION		JOINT TESTING AND SEALING		PIPE LINING	
PIPE DIAMETER	FLOW DEPTH, % OF DIA.	PIPE DIAMETER	FLOW DEPTH, % OF DIA.	PIPE DIAMETER	FLOW DEPTH, % OF DIA.
6 - 10 in.	20%	6 - 12 in.	25%	6 - 10 in.	20%
12 - 24 in.	25%	15 - 24 in.	30%	12 - 24 in.	25%
27 in. or more	30%	27 in. or more	35%	27 in. or more	30%

C. When sewer line flows, as measured in the first manhole upstream of the sewer segment being rehabilitated, exceed the maximum depths listed above or inspection of the complete pipe periphery is necessary for effective testing, sealing or line work, the Contractor shall implement wastewater flow control methods at no additional cost to the Owner

3.03 SEWER PLUGGING OR BLOCKING

A. During any type of sewer replacement work, if necessary to temporarily control wastewater flow, after proper notice is given to the Engineer, the Contractor may plug or block the sewer pipe.

B. A sewer line plug shall be inserted into the pipe at a manhole upstream from the section being inspected, replaced, tested and/or sealed. The plug shall be so designed that during all or any portion of the operation, wastewater flows shall be shut off or substantially reduced in order to properly inspect and test the segment being replaced. After replacement work is complete, flows shall be restored to normal.

3.04 BYPASS PUMPING

A. Where in the opinion of the Engineer pumping is required for wastewater flow control and to assure completion of the television inspection, replacement, lining or testing and sealing work, the Contractor shall furnish pumping equipment, traffic control, conduits, fittings, barricades, safety equipment, power and other necessary equipment. No pumping operations shall be performed from manhole to manhole in which wastewater is allowed to enter surface drainage facilities, ditches, or natural water courses. No additional compensation will be due to the Contractor when by-passing is deemed necessary.

B. Sanitary sewage shall be pumped directly into the nearest downstream available manhole, providing that the existing sewer has capacity to transport the flow, or, if no manhole is available, into tank trucks for hauling sewage. The Contractor shall be responsible for keeping pumps running continuously, 24 hours a day if required, until the by-pass operation is no longer required.

C. The by-pass system shall have adequate capacity to handle existing wastewater flow plus any additional peak flows which may occur during the rehabilitation work process.

3.05 PRECAUTIONS AND LIABILITY

A. During wastewater flow control operations, the Contractor shall take proper precautions to prevent flooding and/or damage to existing sanitary sewer facilities, or to public or private property.

B. The Contractor shall make repairs or replacements or rebuild any damaged section or sections of existing sewers, as directed by the Engineer. All such repairs, replacements, and rebuilding shall be paid for by the Contractor.

C. The Contractor shall make provisions as necessary for handling all flows in existing sewers, connections, and manholes by pipes, flumes, or by other approved methods at all times in which operations would interfere with normal functioning of those facilities.

D. The Contractor shall be responsible for the removal of any debris and sedimentation in the existing sewers, laterals and manholes, etc. which is attributable to work under this Contract.

E. All operations shall be performed by the Contractor in strict accordance with OSHA and any applicable local safety requirements. Particular attention of the Contractor is directed to safety regulations for excavations and entering confined spaces.

F. It is the Contractor's responsibility to notify any property owner having a sewer service connection on the sewer being rehabilitated that such work is being performed. The Contractor shall be solely responsible for any damage caused by property service connection backups caused by the Contractor's sewer rehabilitation operations.

G. If sewage should leak or spill during any of the Contractor's operations under this Contract, the Contractor shall immediately contact the Engineer and implement emergency containment actions.

PART 4 - PAYMENT

4.01 BASIS OF PAYMENT

No direct payment shall be made to the Contractor for this item. The Contractor shall include the cost of this work in the unit price for pipe.

- END OF SECTION -

SECTION 02500

BITUMINOUS PAVEMENT

PART 1 - GENERAL

1.01 DESCRIPTION OF THE WORK

Extent of bituminous pavement paving is shown on the Drawings, including roads, driveways and parking areas.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Unless noted, all specification designations refer to the Tennessee Department of Transportation (TDOT) Standard Specifications, (TDOTSS) Latest Edition. Appropriate portions of the referenced sections of the Specifications shall apply, but all work shall be included in bid items described herein unless otherwise specified or shown on the Drawings.

B. Preparation of subbase is specified in this Division, Section 02200.

C. Crushed stone and dense graded aggregate are specified in this Division, Section 02255.

1.03 QUALITY ASSURANCE

A. Performance: Bituminous seal coat that fails as the result of not meeting the requirements of these Specification shall be corrected at the Contractor's expense.

B. The design plant mix shall be submitted to the Engineer for review and acceptance. The submittal shall include the last date the mixture was approved by the Tennessee Department of Transportation (TDOT) for use on a state road project; and the location where the mixture was recently used, and the name and address of the paving contractor.

PART 2 - PRODUCTS

2.01 BITUMINOUS CONCRETE SURFACE MATERIAL

A. Aggregates shall meet the applicable requirements of the TDOTSS.

B. Bituminous materials shall meet the applicable requirements of the TDOTSS.

C. Bituminous materials for tack coat shall be one of the following: SS-1, SS-1h, CSS-1, CSS-1h, AE-60, RS-1, CRS-1, RC-70 or RC-250.

D. Steel, wood or other suitable material shall be of size and strength necessary to resist movement during bituminous placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.

2.02 BITUMINOUS SEAL COAT MATERIAL

A. Coarse aggregate shall be Tennessee Department of Transportation (TDOT) Standard Size No. 8, meeting applicable requirements of TDOTSS.

B. Bituminous materials shall meet applicable requirements of TDOTSS.

PART 3 - EXECUTION

3.01 SURFACE PREPARATION

The road shall be swept with an approved mechanical sweeper and with wire hand brooms, when necessary. Special care shall be taken to clean the edges of the surface so that full width of the roadway to be treated shall be uniformly clean. Where any mud or earth exists, it shall be removed sufficiently in advance of application of bituminous material to allow the surface to become thoroughly dry.

3.02 BITUMINOUS CONCRETE PAVING

A. Composition of Mixtures: Surface pavement mixture, meeting requirements of the TDOTSS shall be used as determined by local plant mix availability. The mixture shall have been approved recently by the Tennessee Department of Transportation, used recently on a state project, and conform to the requirements below when tested in accordance with ASTM D 1559-76:

Stability, minimum pounds	1200
Flow, 0.01 inch	Min. 6, Max. 16
Percent air voids	Min. 4, Max. 8
Minimum voids in mineral aggregate,	
percent: 3/4 inch	14
1 inch	13

B. Construction Methods: Construction requirements shall conform to applicable requirements of the KDOHSS.

C. A tack coat shall be required to bond new paving to the surface of concrete or brick pavements and bases or existing bituminous surfaces. It shall be applied in accordance with of TDOTSS.

D. Where bituminous paving is placed against vertical surfaces such as curbs, gutters, manhole frames, valve boxes, etc., the vertical face shall be tack coated to seal the surface. Where these surfaces are inaccessible to pressure distributor, the tack coat may be brushed or broomed into place. The tack coat shall not be allowed to spill over onto any horizontal surface outside the area to be paved.

E. Unless otherwise indicated on the Drawings or in these Specifications, the compacted thickness of the bituminous concrete paving shall be a minimum of 2 inches and the minimum ambient temperature for placing shall be 40 deg F. Mixing and laying temperatures shall be as follows:

Aggregates	Min. 240 deg F Max. 325 deg F
Asphalt Cement	Min. 225 deg F Max. 325 deg F
Mixture at Plant (measured in truck)	Min. 240 deg F Max. 325 deg F
Mixture when Placed (measured in truck when discharging)	275 deg ± 20 deg F**

**The 275 deg F + 20 deg F mixture placing temperature is based on 275 deg F being about the

ideal temperature for obtaining optimum compaction under average conditions. However, when the distance between asphalt plant and the job is such that specified placing temperatures cannot be maintained even though maximum mixing temperatures are covered, insulated hauling equipment as described below are used, the minimum placing temperature shall be 225 deg F.

F. Trucks for hauling bituminous mixtures shall have tight, clean and smooth metal beds that have been sprayed with a minimum amount of soap emulsion, paraffin oil, or other approved material that is not detrimental to the mixture to prevent the mixture from adhering to the beds. All trucks shall be equipped with covers of sufficient size to completely cover the located material and all covers shall be securely fastened in place before the truck leaves the plant. Truck beds shall be insulated, when necessary, to maintain the specified temperature to the point of delivery. Any truck causing excessive segregation of material by its spring suspension or other contributing factors shall be discharged from the work until such conditions are corrected.

G. The Contractor shall have an accurate thermometer on the job at all times for verifying all temperature requirements and for taking temperature measurements whenever requested by the Engineer or Owner. The Contractor shall closely control temperature and compaction requirements to achieve quality bituminous paving and related work.

H. Bituminous paving that fails as the result of not meeting the requirements of these Specifications shall be removed and replaced at the Contractor's expense.

- END OF SECTION -

SECTION 02640

VALVES

PART 1 - GENERAL

1.01 WORK INCLUDED

A. The Contractor shall furnish and install valves, gates, hydrants, and miscellaneous piping appurtenances, as indicated on the Drawings and as herein specified.

B. The Drawings and Specifications direct attention to certain features of the equipment, but do not purport to cover all the details of their design. The equipment furnished shall be designed and constructed equal to the high quality equipment manufactured by such firms as are mentioned hereinafter. The Contractor shall furnish and install the equipment complete in all details and ready for operation.

C. Enclosures shall be of a suitable type for the atmospheres in which they are installed.

D. Sizes and capacities not specified herein are indicated on the Drawings.

PART 2 - PRODUCTS

2.01 COMBINATION AIR VALVE FOR SEWAGE

A. Sewage Combination Air Valve shall be single body, double orifice type and shall allow large volumes of air to escape or enter thru the larger diameter air and vacuum orifice.

B. When the pipeline is filled and under pressure the large air and vacuum orifice shall stay closed, and the smaller diameter air release orifice shall remain operative and open to allow small pockets of air accumulating, to escape automatically and independently of the large orifice.

C. The large air and vacuum orifice shall shut-off when the free floating center guided plug is raised, into the orifice, by the lifting force of the Concave bottom float.

D. The float shall be heavily constructed stainless steel; hermetically sealed; and having a concave bottom impact area to provide immediate resistance to flow and instant upwards movement to shut off the large orifice without spilling.

E. The Buna-N seat shall be fastened to the valve cover, without distortion for drop tight shut-off.

F. The Sewage Combination Air Valve shall be fitted with (1) inlet Bronze Ball Valve to isolate from the force main, (1) Blow-off valve, and (1) Flush valve and minimum 5' rubber hose with quick disconnect couplings for back flushing.

G. Valve exterior to be painted Phenolic Primer Red Oxide for high resistance to corrosion.

H. Materials of construction shall be certified to conform to the following A.S.T.M. specifications:

Body & Cover	Cast Iron	ASTM A126 GR.B
Concave Float	Stainless SteeL	ASTM A240 T304
Needle & Seat	Buna-N	
Plug	Brass	ASTM B124
Leverage Frame	Cast Iron	ASTM A126 GR.B

I. Valve to be APCO Series 440SCAV Sewage Combination Air Valve with attachments, as manufactured by Valve and Primer Corporation, or equal.

2.02 PLUG VALVES

A. Valves shall be of the non-lubricated, eccentric type with resilient faced plugs, with flanged ends as shown on the plans. Port areas of 4"-20" valves shall be at least 80% of full pipe area. Port areas of 24" and larger valves shall be at least 70% of full pipe area. Bodies shall be semi-steel with raised seats. Seats in 3" and larger valves shall have a welded-in overlay of not less than 90% pure nickel on all surfaces contacting the plug face. Screwed in seats will not be accepted. Valves shall have stainless steel permanently lubricated upper and lower plug stem bushings. Stem bushings with "o" rings are not acceptable. All valves 4" and larger shall be of the bolted bonnet design. Valves shall be designed so that they can be repacked without removing the actuator or the bonnet from the valve. Packing on all valves shall be adjustable. Plug valves located inside and 4 inches and smaller shall be lever operated. Valves 8 inches and larger shall be gear operated.

B. All exposed nuts, bolts, springs, and washers shall be zinc plated. Means of actuation shall be lever, gear actuator, chain, tee-wrench, extension stem, floor stand, etc., indicated on the plans. Plug valves shall be as manufactured by Dezurik, a unit of General Signal or equal.

C. Valve bodies shall be of ASTM A126 Class B cast iron in compliance with AWWA Standard C-504-70 Section 6.4. All exposed nuts, bolts, springs, washers, etc. shall be zinc plated. Resilient plugs facing shall be of neoprene, suitable for use with sewage.

D. Valves shall be furnished with replaceable, sleeve type bearings in the upper and lower journals. These bearings shall comply with AWWA Standard C507-73, Section 8 paragraphs 8.1, 8.3, and 8.4.

E. Valve shaft seals shall comply with AWWA Standard C507-73 Section 10 and with AWWA C504-70.

F. Valves and actuators for submerged or buried service shall have seals on all shafts and gaskets on valve and actuator mounting brackets for submerged service shall be totally enclosed and shall have gasket seals. All exposed nuts, bolts, springs and washer for submerged valves shall be stainless steel.

G. Valves up to 12-inch shall have 175 psi working pressure, valves larger than 12-inch shall have 150 psi working pressure, unless otherwise noted on the Drawings.

H. Where indicated on the Drawings or necessary due to size or location, valves shall be provided with chain operators with chains extending to within 3 ft. of the floor or operating platform. Chains shall be galvanized. Sprocket wheels shall be provided with chain guides. Valves handwheel centerlines located more than 6 ft. 6 in. above the floor or operating platforms shall be considered as being inaccessible and shall be provided with chain operators as described above. All chain operated valves shall be gear operated.

I. Buried service valves shall be provided with a 2" square operating nut and shall be opened by turning to the left (counterclockwise).

J. The Contractor shall furnish two (2) T-operating wrenches in the lengths necessary to operate the buried gate valves for an operator of average height in a normal working position.

2.02 BALL VALVES

Ball valves shall have a bronze body with stainless steel ball, TFE seats, packing, and gaskets. Valves shall be rated for 125 psi working water pressure.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Valves shall be installed as nearly as possible in the positions indicated on the Drawings consistent with conveniences of operating the handwheel or wrench. All valves shall be carefully erected and supported in their respective positions free from all distortion and strain on appurtenances during handling and installation.

B. All material shall be carefully inspected for defects in workmanship and material, all debris and foreign material cleaned out of valve openings and seats, all operating mechanisms operated to check their proper functioning, and all nuts and bolts checked for tightness.

C. Valves shall not be installed with stems below the horizontal.

D. Valves shall be set plumb and supported adequately in conformance with the instructions of the manufacturer. Valves mounted on the face of concrete shall be shimmed vertically and grouted in place. Valves in the control piping shall be installed so as to be easily accessible.

E. Valves shall be provided with extension stems where required for convenience of operation. Extension stems shall be provided for valves installed underground and elsewhere so that the operating wrench does not exceed 8 ft. in length.

F. A permanent type gasket of uniform thickness shall be provided between flanges of valves.

G. Plug valves in horizontal sewage and sludge piping shall be installed with the shaft horizontal such that when in the open position, the plug is located in the upper part of the valve body. Valves shall be oriented so that in the closed position, the plug is at the upstream end of the valve.

- END OF SECTION -

SECTION 02700

SITE RESTORATION

PART 1 - GENERAL

1.01 CLEAN-UP

Upon completion of the installation of the sewer main and appurtenances, the Contractor shall remove all debris and surplus construction materials resulting from his work. The Contractor shall grade the ground along each side of the pipe trench and/or structure in a uniform and neat manner leaving the construction area in a shape as near as possible to the original ground line.

PART 2 - PRODUCTS

2.01 SEEDING

A. All graded areas shall be seeded at the rate of six (6) pounds of seed per 1,000 square feet. The mixture shall consist of:

Kentucky 31 Fescue	60%
Creeping Red Fescue	20%
Annual Rye Grass	20%

B. After seed has been distributed, the Contractor shall cover areas with straw to a depth of 1-1/2". Any necessary re-seeding or repairing shall be accomplished by the Contractor before final acceptance. Seeding is not a pay item.

PART 3 - EXECUTION

3.01 SITE RESTORATION

A. After installation of sewer lines, the construction site will be restored to its original condition or better. All paved streets, roads, sidewalks, curbs, etc. removed or disturbed during construction shall be replaced, and all materials and workmanship shall conform to standard practices and specifications of the Owner, and/or to the Tennessee Department of Transportation (TDOT) requirements, and specifications, whichever applies. Gravel, cinder or dirt streets, drives and shoulders shall be replaced and sufficiently compacted to provide a surface suitable for carrying the type of traffic normally imposed at the location.

B. All seeded areas shall be watered daily during the germination period, unless rain supplies the required moisture. The Contractor shall replace, at his own expense, trees, shrubs, etc. disturbed during construction.

C. The Contractor shall remove from the site all equipment, unused materials and other items at his expense. The construction site shall be left in a neat, orderly condition, clear of all unsightly items, before the Work is finally accepted.

- END OF SECTION -

DIVISION 03

CONCRETE

SECTION 03600

PRECISION GROUTING

PART 1 - GENERAL

1.01 WORK INCLUDED

A. Provided all labor, material, equipment and services required for grouting of equipment, machinery, structural steel, handrails, anchor bolts and other items or work for which grouting is specified or required. All unnecessary holes, openings and cracks in existing concrete shall be filled and patched.

B. The object of these Specifications is to obtain grout which can be mixed to a flowable consistency (i.e., thinner than plastic consistency), placed in leakproof forms, with a minimum of strapping, without bleed water exceeding specification requirements. The requirement of 24 hour presoak of existing concrete is of prime importance and must be adhered to.

1.02 DESCRIPTION OF WORK

A. High strength, precision support of machine bases and soleplates, setting anchor bolts.

B. Work includes providing a non-shrink, ready-to-use, fluid precision grout material; proportioned, pre-mixed and packaged at the factory; delivered to the job site to place with only the addition of water; forming, placing and curing as specified in this section.

1.03 RELATED WORK

A. Section 03310 - Structural Concrete.

B. Review all divisions and sections for equipment, machinery and other items to be grouted.

1.04 QUALITY ASSURANCE

Comply with the following codes, standard, test and recommended practices for foundation concrete as apply to precision grouting.

A. ACI 304 "Guide for Measuring, Mixing, Transporting and Placing Concrete".

B. ACI 305 "Hot Weather Concreting".

C. ACI 306 "Cold Weather Concreting".

D. ACI 347 "Guide to Formwork for Concrete".

E. ASTM C-91 - Standard Test Method for Time of Set of Hydraulic Cement by Vicat Needle.

F. ASTM C-827 - Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures.

G. Manufacturer's Information on Use of Grout.

H. Corps of Engineers CRD C-621 Corps of Engineers Specification for Nonshrink Grout.

I. ASTM C 109 "Standard Test Method for Compressive Strength of Hydraulic Cement Mortars.

1.05 SUBMITTALS

A. The Contractor shall submit to the Engineer prior to installation, manufacturer's literature and certified test data that material complies with the requirements of these specifications.

PART 2 - PRODUCTS

2.01 GROUT

Cement-based grouts must have a minimum 15 year history of use and meet the following performance requirements at maximum water content. They must not contain expansive cement or metallic particles such as aluminum powder or iron fillings.

A. Plastic Volume Change: The grout shall show no shrinkage (0.0%) and a maximum 4.0% expansion from time of placement until final set when tested according to ASTM C-827.

B. Hardened Volume Change: The grout shall show no shrinkage (0.0%) and a maximum 0.2% expansion in the hardened state when tested according to CRD C-621.

C. Compressive Strength: The grout shall show a minimum of 28-day compressive strength of 5,000 psi when tested according to ASTM C 109, restrained.

D. Creep: The grout shall show creep equal to or less than .6 in./in. x 10^{-3} at 70EF for a minimum of one year when tested according to CPR Creep Test (extrapolated data is not acceptable).

E. Working Time: The grout shall show a consistency greater than 125% for a minimum 45 minutes when tested according to applicable consistency sections of ASTM C 827 at 15 minutes intervals.

F. Tests: Upon request of the Engineer, the Cylinder Plate Test shall be run on any field shipments.

2.02 WATER

Water shall be potable.

PART 3 - EXECUTION

3.01 INSPECTION

A. Inspect concrete surfaces to receive grout and verify that they are free of ice, frost, dirt, grease, oil, curing compounds, paints impregnations and all loose material or foreign matter likely to affect the bond or performance of the grout.

B. Newly placed concrete shall have been placed and cured sufficiently to attain its design strength.

C. Inspect baseplates for rust, oil, and other deleterious substances.

3.02 PREPARATION

A. In order to ensure proper bond to the baseplate and the concrete, all grease, oil, dirt, curing compounds, laitance and other deleterious materials must be completely removed from the concrete and bottom of baseplate.

B. Roughen the surfaces by chipping, sandblasting or other mechanical means to assure bond of the grout to the existing concrete. Loose or broken concrete shall be removed.

C. After concrete surfaces have been washed clean, they shall then be saturated with water for 24 hours prior to placement of cement-based grout.

D. Upon completion of saturation period excess water shall be removed with clean compressed air prior to grouting.

E. Formwork shall be compatible with proposed method of placing grout. Design for rapid, continuous and complete filling of space to be grouted.

1. Build strong, tight forms braced so they will not leak or buckle under weight of fluid grout. On placing side, slant form at 45 degrees angle and pour grout directly on slanted face. On other sides, place form and pour grout directly on slanted face. On other sides, place form 1/2" or more from edge of baseplate and 1" or more higher than underside of the plate.

2. Caulk forms with grouting material being used on inside or a sand-cement mortar outside to prevent leakage and loss of "head". Use expanded polystyrene or other means to caulk between foundation and portions of the baseplate and equipment to seal off areas where grout is not desired.

3.03 INSTALLATION

A. Preparation of grout shall be in paddle-type mortar mixer suitable mechanical mixer. DO NOT MIX BY HAND. Mix according to the manufacturer's recommendations.

B. Mix grout adjacent to area being grouted, have sufficient manpower and equipment available for rapid and continuous mixing and placing. Do not add cement, sand or pea gravel, additives.

C. Avoid a consistency that produces bleeding. Mix materials for a minimum of 3 minutes and not more than 5 minutes and place immediately. Do not retemper. Do not use mixing water with a temperature above 80 degrees F (27 degrees C).

D. Grout shall be placed under environmental conditions acceptable to manufacturer's standards for the product.

E. Placing: Grout may be drypacked, flowed, vibrated or pumped into place. All grouting shall take place from one side of the plate to the other to avoid trapping air.

F. Cutback: Just before the grout has reached its final set, the grout shall be cut back to the lower edge of the bearing or column base plate. A 45 degree angle or vertical cutback shall be used.

G. Curing: The grout shall be kept moist for a minimum of three days. The method needed to protect the grout will depend on temperature, humidity and wind. Wet burlap, a soaker hose, sun shading, ponding and in extreme conditions a combination of methods shall be employed.

H. Field service representative of the manufacturer shall be available during initial planning for installation to suggest recommended procedures and at start of placement for further suggestions. A minimum of three (3) days notice shall be given by the Contractor to the manufacturer prior to use of the product.

-- END OF SECTION --

DIVISION 05

METALS

SECTION 05500

METAL FABRICATIONS

PART 1 GENERAL

1.1 SUMMARY

A. This Section includes miscellaneous metal fabrications as shown on the Contract Drawings, complete including fabrication, shop finishing and installation.

1.2 REFERENCES

A. Materials and installation shall be in accordance with the latest revisions of the following codes, standards and specifications, except where more stringent requirements are specified herein:

1. American Society for Testing and Materials (ASTM)

   a. ASTM A36 – Angles, plates and threaded rods.

   b. ASTM A53 - Pipe, steel, black and hot-dipped, zinc-coated welded and seamless.

   c. ASTM A123 - Zinc (Hot-Galvanized) Coatings on Products Fabricated from Rolled, Pressed and Forged Steel Shapes, Plates, Bars, and Strip.

   d. ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

   e. ASTM A167 – Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.

   f. ASTM A193 – Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.

   g. ASTM A194 – Carbon and Alloy Steel Nuts for Bolts for High Pressure or High Temperature Service.

   h. ASTM A269 – Seamless and Welded Austenitic Stainless Steel Tubing

   i. ASTM A276 – Stainless Steel Bars and Shapes

   j. ASTM A283 - Carbon Steel Plates, Shapes, and Bars.

   k. ASTM A307 - Carbon Steel Externally Threaded Standard Fasteners.

   l ASTM A325 - High Strength Bolts for Structural Steel Joints.

   m. ASTM A386 - Zinc-Coating (Hot-Dip) on Assembled Steel Products.

   n. ASTM A500 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Round and Shapes.

   o. ASTM A992, Grade 50 - Structural Steel.

   p. ASTM B177 - Chromium Electroplating on Steel for Engineering Use.

   q. ASTM B221 - Aluminum and Aluminum-Alloy Extruded bars, rods, wire, shapes, and tubes.

   r. ASTM B308 - Aluminum-Alloy 6061-T6 Standard Structural Shapes, Rolled or Extruded.

   s. ASTM F1554 – Anchor bolts.

2. American Welding Society (AWS)

   a. AWS A2.0 - Standard Welding Symbols.

b. AWS D1.1 - Structural Welding Code.

3. SSPC - Steel Structures Painting Council.

1.3 QUALITY ASSURANCE

A. Perform work in accordance with the following:

1. Prepare shop drawings under direct supervision of a Professional Engineer experienced in design of this work and licensed in the State of Tennessee.

2. Use certified welders employed on the Work, with verification of AWS qualification within the previous 12 months.

1.4 SUBMITTALS

A. In addition to those submittals identified in the General Provisions, the following items shall also be submitted:

1. Shop drawings indicating profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.

2. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.

1.5 FIELD MEASUREMENTS

A. Verify that field measurements are as indicated on shop drawings.

PART 2 PRODUCTS

2.1 MATERIALS AND CONSTRUCTION

A. Structural steel sections shall be ASTM A992, Grade 50.

B. Steel angles, plates and threaded rods shall be ASTM A36.

C. Steel anchor bolts shall be ASTM F1554, Grade 36 minimum.

D. Aluminum sections shall be ASTM B308, Alloy 6061-T6.

E. Steel tubing shall be ASTM A500, Grade B.

F. Steel pipe shall be ASTM A53, Grade B, Schedule 40. Bollards shall be Schedule 80.

G. Bolts, nuts, and washers for structural steel connections shall be ASTM A325 galvanized to ASTM A153 for galvanized components.

H. Stainless steel extrusions shall comply with ASTM A269, Type 304 or 316.

I. Stainless steel bolts shall be ASTM A193, Type 304 or 316, grade B8 or B8M.

J. Stainless steel nuts shall be ASTM A194, Type 304 or 316, grade 8 or 8M.

K. Stainless steel washers shall be ANSI B18.22.1.

L. Welding materials shall comply with AWS D1.1; type required for materials being welded.

M. Adhesive anchors for solid base substrates shall be a two-component adhesive system supplied in manufacturer's standard side-by-side or co-axial cartridge dispensed through a static mixing nozzle. System shall be capable of anchoring internally threaded inserts, threaded rods and steel reinforcing. Adhesive anchor system shall be one of the following:

1. For applications above 40°F, use one of the following:

   a. HIT HY 150 MAX or HIT RE 500 Injection Adhesive system by HILTI, Inc.
   b. SET High Strength Epoxy system by Simpson Strong-Tie

2. For applications below 40°F, use one of the following:

   a. HIT-ICE Injection Adhesive system by HILTI, Inc.
   b. ACRYLIC-TIE system by Simpson Strong-Tie

N. Adhesive anchors for hollow base substrates shall be a two-component adhesive system supplied in manufacturer's standard side-by-side or co-axial cartridge dispensed through a static mixing nozzle. System shall be capable of anchoring internally threaded inserts, threaded rods and steel reinforcing. Adhesive anchor system shall be one of the following:

1. For applications above 40°F, use one of the following:

   a. HIT HY 20 Injection Adhesive system with screen tube by HILTI, Inc.
   b. SET High Strength Epoxy system with screen tube by Simpson Strong-Tie

2. For applications below 40°F, consult manufacturer for recommendation.

O. Expansion bolts shall be HSL Expansion anchors by HILTI, Inc. or WEDGE-ALL wedge anchors by Simpson Strong-Tie.

P. Primer for steel shall be fast-curing, lead and chromate free, universal primer with good resistance to normal atmospheric corrosion, complying with performance requirements of FS-TT-P-664. Primer shall be compatible with finish paint system.

2.2 FABRICATION

A. Fit and shop assemble in largest practical sections, for delivery to site.

B. Fabricate items with joints tightly fitted and secured.

C. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

D. Exposed mechanical fastenings shall consist of flush countersunk screws or bolts, unobtrusively located, consistent with design of component, except where specifically noted otherwise.

E. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.3 FINISHES

A. Surface preparation, primer and finish coating shall be as specified in specification Section 09900 Painting.

B. Do not prime surfaces in direct contact with concrete or where field welding is required.

C. Items to be galvanized shall be given a minimum 2.0 oz/sq ft zinc coating in accordance with ASTM A386.

PART 3 EXECUTION

3.1 INSTALLATION

A. Examination

1. Verify that field conditions are acceptable and are ready to receive work.

2. Beginning of installation means erector accepts existing conditions.

B. Preparation

1. Clean and strip primed steel items to bare metal where site welding is required.

2. Supply items required to be cast into concrete or embedded in masonry with setting templates.

C. Erection

1. Install items plumb and level, accurately fitted, free from distortion or defects.

2. Allow for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.

3. Field weld components indicated on shop drawings.

4. Perform field welding in accordance with AWS D1.1.

D. Erection Tolerances

1. Maximum variation from plumb shall be 1/4 inch per 10 feet, non-cumulative.

2. Maximum offset from true alignment shall be 1/4 inch.

E. Schedule

1. Bollards shall be steel pipe, concrete filled, crowned cap, size as detailed; galvanized.

2. Miscellaneous framing angles, channels and plates not attached to structural framing shall be steel, prime painted. However, if exterior installation, galvanized, and prime painted.

4. Overhead door wall openings shall be steel channel sections, galvanized, and prime painted.

- - END OF SECTION - -