GENERAL UTILITY NOTES AND INSTRUCTIONS APPLICABLE TO ALL UTILITY WORK MADE A PART OF THE ROAD CONSTRUCTION CONTRACT

The contractor should be aware the following utility notes and KYTC Utility Bid Item Descriptions shall supersede, replace and take precedence over any and all conflicting information that may be contained in utility owner supplied specifications contained in the contract, on plans supplied by the utility owner, or any utility owner specifications or information externally referenced in this contract.

Where information may have been omitted from these notes, bid item descriptions, utility owner supplied specifications or plans; the KYTC Standard Specifications for Road and Bridge Construction shall be referenced.

PROTECTION OF EXISTING UTILITIES

The contractor will be responsible for contacting all utility facility owners on the subject project to coordinate his activities. The contractor will coordinate his activities to minimize and, where possible, avoid conflicts with utility facilities. Due to the nature of the work proposed, it is unlikely to conflict with the existing utilities beyond minor facility adjustments. Where conflicts with utility facilities are unavoidable, the contractor will coordinate any necessary relocation work with the facility owner and Resident Engineer. The utility facilities depicted in the plans have been determined using data garnered by varied means and with varying degrees of accuracy: from the facility owners, a result of S.U.E., field inspections, and/or reviews of record drawings. The facilities defined may not be inclusive of all utilities in the project scope and are not Level A quality, unless specified as such. It is the contractor's responsibility to verify all utilities and their respective locations before excavating. The contractor shall make every effort to protect underground facilities from damage as prescribed in the Underground Facility Damage Protection Act of 1994, Kentucky Revised Statute KRS 367.4901 to 367.4917. It is the contractor's responsibility to determine and take steps necessary to be in compliance with federal and state damage prevention directives.

PREQUALIFIED UTILITY CONTRACTORS

Some utility owners may require contractors that perform relocation work on their respective facilities as a part of the road contract be prequalified or preapproved by the utility owner. Those utility owners with a prequalification or preapproval requirement are as follows:

Oldham County Water District

The bidding contractor needs to choose a subcontractor listed below who is approved by Oldham County Water District:

- *Louisville Paving*
- *Pace Contracting*
- *Mac Construction*
- *Flynn Brothers Contracting*
- *Cleary Construction, Inc.*
- *Smith Contractors, Inc.*
- *Stotts Construction Co.*
- *ConnHurst*

The bidding contractor needs to review the above list and choose from the list of approved subcontractors at the end of these general notes as identified above before bidding. When the list of approved subcontractors is provided, only subcontractors shown on the following list(s) will be allowed to work on that utility as a part of this contract.

When the list of approved subcontractors for the utility work is not provided in these general notes, the utility work can be completed by the prime contractor. If the prime contractor chooses to subcontract the work, the subcontractor shall be prequalified with the KYTC Division of Construction Procurement in the work type of "Utilities" (I33). Those who would like to become prequalified may contact the Division of Construction Procurement at (502) 564-3500. Please note: it could take up to 30 calendar days for prequalification to be approved. The prequalification does not have to be approved prior to the bid, but must be approved before the subcontract will be approved by KYTC and the work can be performed.

CONTRACT ADMINISTRATION RELATIVE TO UTILITY WORK

All utility work is being performed as a part of a contract administered by KYTC; there is not a direct contract between the utility contractor and utility owner. The KYTC Section Engineer is ultimately responsible for the administration of the road contract and any utility work included in the contract.

SUBMITTALS AND CORRESPONDENCE

All submittals and correspondence of any kind relative to utility work included in the road contract shall be directed to the KYTC Section Engineer, a copy of which may also be supplied to the utility owner by the contractor to expedite handling of items like material approvals and shop drawings. All approvals and correspondence generated by the utility owner shall be directed to the KYTC Section Engineer. The KYTC Section Engineer will relay any approvals or correspondence to the utility contractor as appropriate. At no time shall any direct communication between the utility owner and utility contractor without the communication flowing through the KYTC Section Engineer be considered official and binding under the contract.

ENGINEER

Where the word "Engineer" appears in any utility owner specifications included in this proposal, utility owner specifications included as a part of this contract by reference or on the utility relocation plans, it shall be understood the "Engineer" is the Kentucky Transportation Cabinet (KYTC) Section Engineer or designated representative and the utility owner engineer or designated representative jointly. Both engineers must mutually agree upon all decisions made with regard to the utility construction. The Transportation Cabinet, Section Engineer shall make all final decisions in all disputes.

INSPECTOR OR RESIDENT PROJECT REPRESENTATIVE

Where the word "Inspector" or "Resident Project Representative" appears in the utility specifications included in this proposal, utility owner specifications included as a part of this contract by reference or on the utility relocation plans, it shall be understood the "Inspector" or "Resident Project Representative" is the utility owner inspector and KYTC inspector jointly. The Transportation Cabinet, Section Engineer shall make all final decisions in all disputes.

NOTICE TO UTILITY OWNERS OF THE START OF WORK

One month before construction is to start on a utility, the utility contractor shall make notice to the KYTC Section Engineer and the utility owner of when work on a utility is anticipated to start. The utility contractor shall again make confirmation notice to the KYTC Section Engineer and the utility owner one week before utility work is to actually start.

UTILITY SHUTDOWNS

The Contractor shall not shut down any active and in-service mains, utility lines or services for any reason unless specifically given permission to do so by the utility owner. The opening and closing of valves and operating of other active utility facilities for main, utility line or utility service shut downs are to be performed by the utility owner unless specific permission is given to the contractor by the owner to make shutdowns . If and when the utility owner gives the contractor permission to shutdown mains, utility lines or utility services, the contractor shall do so following the rules, procedures and regulations of the utility owner. Any permission given by the utility owner to the contractor to shutdown active and in-service mains, utility lines or services shall be communicated to the KYTC Section Engineer by the utility owner that such permission has been given.

Notice to customers of utility shut downs is sometimes required to be performed by the utility contractor. The contractor may be required; but, is not limited to, making notice to utility customers in a certain minimum amount of time in advance of the shut down and by whatever means of communication specified by the utility owner. The means of communication to the customer may be; but is not limited to, a door hanger, notice by newspaper ad, telephone contact, or any combination of communication methods deemed necessary, customary and appropriate by the utility owner. The contractor should refer to the utility owner specifications for requirements on customer notice.

Any procedure the utility owner may require the contractor to perform by specification or plan note and any expense the contractor may incur to comply with the utility owner's shut down procedure and notice to customers shall be considered an incidental expense to the utility construction.

CUSTOMER SERVICE AND LATERAL ABANDONMENTS When temporary or permanent abandonment of customer water, gas, or sewer services or laterals are necessary during relocation of utilities included in the contract, the utility contractor shall perform these abandonments as part of the contract as incidental work. No separate payment will be made for service line and lateral abandonments. The contractor shall provide all labor, equipment and materials to accomplish the temporary or permanent abandonment in accordance with the plans, specifications and/or as directed by the engineer. Abandonment may include, but is not limited to, digging down on a water or gas main at the tap to turn off the tap valve or corporation stop and/or capping or plugging the tap, digging down on a sewer tap at the main and plugging or capping the tap, digging down on a service line or lateral at a location shown on the plans or agreeable to the engineer and capping or plugging, or performing any other work necessary to abandon the service or lateral to satisfactorily accomplish the final utility relocation.

STATIONS AND DISTANCES

All stations and distances, when indicated for utility placement in utility relocation plans or specifications, are approximate; therefore, some minor adjustment may have to be made during construction to fit actual field conditions. Any changes in excess of 6 inches of plan location shall be reviewed and approved jointly by the KYTC Section Engineer or designated representative and utility owner engineer or designated representative. Changes in location without prior approval shall be remedied by the contractor at his own expense if the unauthorized change creates an unacceptable conflict or condition.

RESTORATION

Temporary and permanent restoration of paved or stone areas due to utility construction shall be considered incidental to the utility work. No separate payment will be made for this work. Temporary restoration shall be as directed by the KYTC Section Engineer. Permanent restoration shall be "in-kind" as existing.

Restoration of seed and sod areas will be measured and paid under the appropriate seeding and sodding bid items established in the contract for roadway work.

BELOW ARE NOTES FOR WHEN "INST" ITEMS ARE IN THE CONTRACT MEANING THE UTILITY COMPANY IS PROVIDING CERTAIN MATERIALS FOR UTILITY RELOCATION

MATERIAL

Contrary to Utility Bid Item Descriptions, those bid items that have the text **"Inst"** at the end of the bid item will have the major components of the bid item provided by the utility owner. No direct payment will be made for the major material component(s) supplied by the utility company. All remaining materials required to construct the bid item as detailed in utility bid item descriptions, in utility specifications and utility plans that are made a part of this contract will be supplied by the contractor. The contractor's bid price should reflect the difference in cost due to the provided materials.

The following utility owners have elected to provide the following materials for work under this contract:

"No materials are being supplied by the utility owner(s). All materials are to be supplied by the contractor per bid item descriptions, utility specifications and utility plans."

SECURITY OF SUPPLIED MATERIALS

If any utility materials are to be supplied by the utility owner, it will be the responsibility of the utility contractor to secure all utility owner supplied materials after delivery to the project site. The utility contractor shall coordinate directly with the utility owner and their suppliers for delivery and security of the supplied materials. Any materials supplied by the utility owner and delivered to the construction site that are subsequently stolen, damaged or vandalized and deemed unusable shall be replaced with like materials at the contractor's expense.

UTILITY OWNER SPECIFICATIONS

The awarded contractor, and/or the utility subcontractor, shall follow the OCWD Technical Specifications which are included in the project proposal.
The awarded contractor, and/or the utility subcontractor, shall follow the current edition of the MSD Standard Specifications.
https://louisvillemsd.org/sites/default/files/inline-files/MSD_Standard_Specifications_090109.pdf

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PREQUALIFIED UTILITY CONTRACTORS

Some utility owners may require contractors that perform relocation work on their respective facilities as a part of the road contract be prequalified or preapproved by the utility owner. Those utility owners with a prequalification or preapproval requirement are as follows:

Lagrange Utility Commission and Oldham County Water District

The bidding contractor needs to choose a subcontractor listed below who is approved by both Lagrange Utility Commission and Oldham County Water District:

- *Louisville Paving*
- *Pace Contracting*
- *Mac Construction*
- *Flynn Brothers Contracting*
- *Cleary Construction, Inc.*
- *Smith Contractors, Inc.*
- *Stotts Construction Co.*
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INSPECTOR OR RESIDENT PROJECT REPRESENTATIVE

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Notice to customers of utility shut downs is sometimes required to be performed by the utility contractor. The contractor may be required; but, is not limited to, making notice to utility customers in a certain minimum amount of time in advance of the shut down and by whatever means of communication specified by the utility owner. The means of communication to the customer may be; but is not limited to, a door hanger, notice by newspaper ad, telephone contact, or any combination of communication methods deemed necessary, customary and appropriate by the utility owner. The contractor should refer to the utility owner specifications for requirements on customer notice.

Any procedure the utility owner may require the contractor to perform by specification or plan note and any expense the contractor may incur to comply with the utility owner's shut down procedure and notice to customers shall be considered an incidental expense to the utility construction.

CUSTOMER SERVICE AND LATERAL ABANDONMENTS When temporary or permanent abandonment of customer water, gas, or sewer services or laterals are necessary during relocation of utilities included in the contract, the utility contractor shall perform these abandonments as part of the contract as incidental work. No separate payment will be made for service line and lateral abandonments. The contractor shall provide all labor, equipment and materials to accomplish the temporary or permanent abandonment in accordance with the plans, specifications and/or as directed by the engineer. Abandonment may include, but is not limited to, digging down on a water or gas main at the tap to turn off the tap valve or corporation stop and/or capping or plugging the tap, digging down on a sewer tap at the main and plugging or capping the tap, digging down on a service line or lateral at a location shown on the plans or agreeable to the engineer and capping or plugging, or performing any other work necessary to abandon the service or lateral to satisfactorily accomplish the final utility relocation.

STATIONS AND DISTANCES

All stations and distances, when indicated for utility placement in utility relocation plans or specifications, are approximate; therefore, some minor adjustment may have to be made during construction to fit actual field conditions. Any changes in excess of 6 inches of plan location shall be reviewed and approved jointly by the KYTC Section Engineer or designated representative and utility owner engineer or designated representative. Changes in location without prior approval shall be remedied by the contractor at his own expense if the unauthorized change creates an unacceptable conflict or condition.

RESTORATION

Temporary and permanent restoration of paved or stone areas due to utility construction shall be considered incidental to the utility work. No separate payment will be made for this work. Temporary restoration shall be as directed by the KYTC Section Engineer. Permanent restoration shall be "in-kind" as existing.

Restoration of seed and sod areas will be measured and paid under the appropriate seeding and sodding bid items established in the contract for roadway work.

BELOW ARE NOTES FOR WHEN "INST" ITEMS ARE IN THE CONTRACT MEANING THE UTILITY COMPANY IS PROVIDING CERTAIN MATERIALS FOR UTILITY RELOCATION

MATERIAL

Contrary to Utility Bid Item Descriptions, those bid items that have the text **"Inst"** at the end of the bid item will have the major components of the bid item provided by the utility owner. No direct payment will be made for the major material component(s) supplied by the utility company. All remaining materials required to construct the bid item as detailed in utility bid item descriptions, in utility specifications and utility plans that are made a part of this contract will be supplied by the contractor. The contractor's bid price should reflect the difference in cost due to the provided materials.

The following utility owners have elected to provide the following materials for work under this contract:

"No materials are being supplied by the utility owner(s). All materials are to be supplied by the contractor per bid item descriptions, utility specifications and utility plans."

SECURITY OF SUPPLIED MATERIALS

If any utility materials are to be supplied by the utility owner, it will be the responsibility of the utility contractor to secure all utility owner supplied materials after delivery to the project site. The utility contractor shall coordinate directly with the utility owner and their suppliers for delivery and security of the supplied materials. Any materials supplied by the utility owner and delivered to the construction site that are subsequently stolen, damaged or vandalized and deemed unusable shall be replaced with like materials at the contractor's expense.

SPECIAL NOTE FOR GENERAL UTILITY COORDINATION

The contractor should be aware that there is UTILITY CONSTRUCTION INCLUDED IN THIS ROAD CONSTRUCTION CONTRACT. The following utility companies have facilities which are to be relocated by the road contractor as included in this contract: Louisville MSD, and Oldham County Water District.

The following utility companies have facilities which are to be relocated by the company, or their contractor, and is to be coordinated with the road contractor: LG&E (electric distribution and transmission), AT&T, and Verizon MCI. Utility relocations are expected along KY 393 from STA. 375+00 to Dispatchers Way until March 2027.

The roadway contractor will be responsible for contacting all utility facility owners on the subject project to coordinate construction activities. The Contractor shall communicate, cooperate, and coordinate with the Department, the utility owners and their contractors, as necessary throughout the utility relocation phase. The Contractor shall be responsible for all construction phase scheduling and coordination needed to ensure that the road construction and utility relocation work may effectively take place. No delay claims will be considered due to utility relocations.

This item shall include assignment of a Utility Coordinator for the project to coordinate plans, work and schedules directly with the utility companies and KYTC personnel. This item includes responsibility to ensure the project progresses efficiently and in accordance with the proposed contract documents. The Department may consult the Utility Coordinator on all matters of utility construction.

This includes conducting weekly on-site coordination meetings with involved utility companies and their contractors to manage utility relocation activity, resolve conflicts with the road activity, and minimize impact to the project. The department shall be invited to Utility Coordination meetings.

Any changes in the proposed scope, design, construction, cost, and/or schedule for the utility work shall be approved by the Department.

The Department will consider payment as full compensation for all work required under this note.

Code	Item Description	Unit
24845EC	Utility Coordination	Lump Sum

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Technical Specifications

DIVISION 46 – WATER TREATMENT EQUIPMENT

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DIVISION 01

GENERAL REQUIREMENTS

SECTION 012213 – BASIS OF MEASUREMENT AND PAYMENT - WATER

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. The Contractor shall furnish all necessary labor, machinery, tools, apparatus, equipment, materials, service and other necessary supplies and perform all Work shown on the Drawings and/or described in the Specifications and Contract Documents at the unit prices as indicated by the Bidder in the Bid.

B. The Bidder declares that they have examined the site of the Work and informed themselves fully in regard to all conditions pertaining to the place where the Work is to be done; that they have examined the Plans, Specification and Contract Documents for the Work, and have read all special provisions furnished prior to the opening of bids; and that they have further satisfied themselves relative to the Work to be performed. The Bidder further declares that they understand that unit quantities shown in the Proposal are approximates only, are subject to increase or decrease, and that, should the quantities of any of the items be decreased, the Bidder will make no claim for the anticipated profits. In addition, the Owner also reserves the right to adjust quantities, either by addition or deletion and as-BID unit price shall remain in effect for these quantity adjustments.

C. All excavation required of the work shall be done as part of the total price for the complete project. All excavation shall be unclassified.

1.2 PAY ITEMS

A. The items listed hereinafter refer to and are the same items listed in the PROPOSAL hereinbefore and constitute all of the pay items in this Contract. Any other items of Work listed in the Specifications or shown on the Drawings shall be considered incidental to the above items.

1.3 WATER PIPE

A. Payment for water pipe shall be as described in the KYTC Standardized Water Bid Descriptions: Section 012213.10.

B. Installation of concrete thrust block shall be included as part of this pay item and considered incidental to the installation of the water pipe.

C. Water piping that requires nitrile gaskets as described in the Contractor Documents shall be included as part of this pay item and considered incidental to the installation of the water pipe.

1.4 WATER VALVE

A. Payment for water valves shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10

1.5 WATER VALVES SPECIAL (INSERTING VALVES AND BOXES)

A. Payment for furnishing and installing inserting valves and boxes will be made at their respective contract unit price each, complete in place, which price includes compensation for furnishing and delivering all equipment and machinery to install insertion valve, excavation (including rock), exposing existing water main, installing tapping saddle and tapping cartridge on existing main, blocking, drilling and tapping existing live water main, dewatering, installation of insertion valve, backfilling, surface restoration (include concrete and asphalt pavement replacement), and all other installation requirements necessary to complete the insertion valve.

1.6 WATER FIRE HYDRANT ASSEMBLY

A. Payment for water fire hydrant assembly shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.7 WATER FIRE HYDRANT REMOVE

A. Payment for water fire hydrant assembly shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.8 WATER CAP EXISTING WATER MAIN

A. Payment for capping existing water main shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.9 WATER TAPPING SLEEVE AND VALVE

A. Payment for connections to existing water mains using a tapping sleeve and valve shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.10 WATER TIE-IN

A. Payment for connection to existing water mains shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.11 WATER METER RELOCATE

A. Payment for relocation of an existing service meter shall be as described in the KYTC

Standardized Water Bid Descriptions; Section 012213.10.

1.12 WATER ENCASEMENT STEEL BORED

A. Payment for steel encasement bore shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.13 WATER ENCASEMENT STEEL OPEN CUT

A. Payment for steel encasement open cut shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.14 WATER SERVICE LONG SIDE

A. Payment for customer service installation across the centerline of a public roadway shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.15 WATER SERVICE SHORT SIDE

A. Payment for customer service installation not crossing the centerline of a public roadway shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.16 WATER LINE MARKER

A. Payment for water line marker installation shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.17 W STRUCTURE REMOVAL (EXISTING CHECK VALVE VAULT)

A. Payment for removal of existing check valve vault and delivery of check valve and interior appurtenances to OCWD office will be made at the respective contract unit price lump sum, which price shall include compensation for the excavation (including rock), removal of the existing check valve vault, capping existing influent and effluent lines of check valve vault, transportation of the check valve and interior appurtenances to OCWD office, backfilling, surface restoration, and all other requirements necessary to remove and transport.

B. Concrete vault can be disposed of at the Contractor’s or KYTC’s discretion. OCWD doesn’t need this transported to there office.

1.18 SAFELOADING

A. Payment for safeloading existing watermains that will remain abandoned piping under highway shall be made at their respective contract unit price cubic yard, which price includes

compensation for furnishing and delivering all equipment and material to safeload the piping, excavation (including rock), exposing existing water main, backfilling, surface restoration (include concrete and asphalt pavement replacement), and all other installation requirements necessary to complete the safeloading.

1.19 WATER FLUSH HYDRANT ASSEMBLY

A. Payment for water flush hydrant assembly shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.20 WATER VALVE VAULT (CHECK VALVE VAULT)

A. Payment for water valve vault shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 012213

Standard Water Bid Item Descriptions

THESE BID ITEM DESCRIPTIONS SHALL SUPERCEDE ANY BID ITEM DESCRIPTIONS CONTAINED IN UTILITY OWNER SUPPLIED SPECIFICATIONS PROVIDED ELSEWHERE IN THIS PROPOSAL.

W AIR RELEASE VALVE This bid item description shall apply to all air release valve installations of every size except those defined as "Special". This item shall include the air release valve, main to valve connecting line or piping, manhole, vault, structure, access casting or doors, tapping the main, labor, equipment, excavation, proper backfill, and restoration required to install the air release valve at the location shown on the plans or as directed, in accordance with the specifications and standard drawings, complete and ready-for-use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

BOLLARDS This item is for payment for furnishing and installing protective guard posts at above-ground utility installations. A bollard may consist of, but is not limited to, a steel post set in concrete or any other substantial post material. This item shall include all labor, equipment, and materials needed for complete installation of the bollard, as specified by the utility owner specifications and plans. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

NOTE: A bid code for this item has been established in standard roadway bid items and shall be used for payment of this item. The bid code is 21341ND.

W CAP EXISTING MAIN This item shall include the specified cap, concrete blocking and/or mechanical anchoring, labor, equipment, excavation, backfill, and restoration required to install the cap on an existing main to be left in service at the location shown on the plans or as directed, in accordance with the specifications. This item is not to be paid to cap new main installations or mains that are to be abandoned. This pay item is only to be paid to cap existing mains to be left in service. Caps on new mains are to be considered incidental to the new main, as are other fittings, and are not to be paid under this item. All caps on existing mains shall be paid under this one bid item included in the contract, regardless of size. No separate bid items will be established for size variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

Plugging of existing abandoned mains shall be performed and paid in accordance with Section 708.03.05 of KYTC Standard Specifications for Road and Bridge Construction, using Bid code 01314, Plug Pipe.

W CATHODIC PROTECTION This item is for providing and installing all cathodic protection materials to iron pipe and fittings, as specified in plans and specifications, complete and ready-for-use. Materials to be supplied and installed by the contractor shall include, but are not limited to, anodes, wire, fusion kits, test stations, and/or marker posts. All cathodic protection required for the entire project shall be paid under this one item. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LUMP SUM (LS) when complete.

W DIRECTIONAL BORE Payment under this item is made whenever the plans or specifications specifically show directional boring is to be utilized to minimize the impact of open-cut for the installation of water main under streets, creeks, etc. Payment under this item shall include the specified bore pipe, labor, and equipment. No separate payment shall be made for bore pipe installed in the bore, whether used as a carrier pipe or an encasement of a separate carrier pipe. This item shall also include pipe anchors at

each end of the bore, when specified, to prevent the creep or contraction of the bore pipe. Carrier pipe installed within a bore pipe shall be paid separately under pipe items. Payment under this item shall not be size specific and no separate bid items will be established for size variations. The bore pipe sizes to be included under this item shall be as shown on the plans and/or in the specifications. Any and all directional bores in each contract shall be paid under one directional bore bid item included in the contract, regardless of size. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

W ENCASEMENT CONCRETE This item shall include all labor, equipment, excavation, concrete, reinforcing steel, backfill, restoration, etc., to construct the concrete encasement of the water main as shown on the plans, and in accordance with the specifications and standard drawings. Payment under this item shall be in addition to the carrier pipe, as paid under separate bid items. Carrier pipe is not included in this bid item. Any and all concrete encasements shall be paid under one bid item included in the contract, regardless of the size of the carrier pipe or the volume of concrete or steel reinforcement, as specified in the plans and specifications. No separate bid items will be established for size variations. Measurement of pay quantity shall be from end of concrete to end of concrete. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

W ENCASEMENT STEEL BORED This item shall include the steel encasement pipe size as specified on the plans and in the specifications, casing spacers, end seals, labor, and equipment to bore and install the encasement in accordance with the plans and specifications, complete and ready-for-use. The size shall be the measured internal diameter of the encasement pipe. The sizes of encasement to be paid under the size ranges specified in the bid items shall be as follows:

Range 1 = All encasement sizes greater than 2 inches to and including 6 inches
Range 2 = All encasement sizes greater than 6 inches to and including 10 inches
Range 3 = All encasement sizes greater than 10 inches to and including 14 inches
Range 4 = All encasement sizes greater than 14 inches to and including 18 inches
Range 5 = All encasement sizes greater than 18 inches to and including 24 inches
Range 6 = All encasement sizes greater than 24 inches

(Encasement sizes of 2 inches internal diameter or less shall not be paid separately but shall be considered incidental to the carrier pipe.) Payment under this bid item shall not include the carrier pipe. Carrier pipe shall be paid under a separate bid item. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

W ENCASEMENT STEEL OPEN CUT This item shall include the steel encasement pipe size as specified on the plans and in the specifications, casing spacers, end seals, labor, and equipment to open-cut and install the encasement in accordance with the plans and specifications, complete and ready-for-use. The size shall be the measured internal diameter of the encasement pipe. The size encasement to be paid under the size ranges specified in the bid items shall be as follows:

Range 1 = All encasement sizes greater than 2 inches to and including 6 inches
Range 2 = All encasement sizes greater than 6 inches to and including 10 inches
Range 3 = All encasement sizes greater than 10 inches to and including 14 inches
Range 4 = All encasement sizes greater than 14 inches to and including 18 inches
Range 5 = All encasement sizes greater than 18 inches to and including 24 inches
Range 6 = All encasement sizes greater than 24 inches

(Encasement sizes of 2 inches internal diameter or less shall not be paid separately but shall be considered incidental to the carrier pipe.) Payment under this bid item shall not include the carrier pipe. Carrier pipe shall be paid under a separate bid item. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

W FIRE HYDRANT ADJUST This item includes all labor, equipment, excavation, materials, and backfill to adjust the existing fire hydrant using the fire hydrant manufacturer's extension kit for adjustments of 18" or less. Adjustments greater than 18" require anchoring couplings and vertical bends to adjust to grade. The Contractor will supply and install all anchor couplings, bends, fire hydrant extension, concrete blocking, restoration, granular drainage material, etc., needed to adjust the fire hydrant, complete and ready-for-use as shown on the plans, and in accordance with the specifications and standard drawings. This also includes allowing for the utility owner inspector to inspect the existing fire hydrant prior to adjusting, contractor returning unusable fire hydrants to the utility owner warehouse and picking up a replacement hydrant. No additional payment will be made for rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete and ready for use.

W FIRE HYDRANT ASSEMBLY This item includes all labor, equipment, new fire hydrant, isolating valve and valve box, concrete pad around valve box (when specified in specifications or plans), piping, anchoring tee, anchoring couplings, fire hydrant extension, excavation, concrete blocking, granular drainage material, backfill, and restoration, to install a new fire hydrant assembly as indicated on plans and standard drawings, compete and ready-for-use. No additional payment will be made for rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W FIRE HYDRANT RELOCATE This item includes all labor and equipment to remove the existing fire hydrant from its existing location and to reinstall at a new location. This item shall include a new isolating valve and valve box, concrete pad around valve box (when required in specifications or plans), new piping, new anchoring tee, anchoring couplings, fire hydrant extensions, concrete blocking, restoration, granular drainage material, excavation, and backfill as indicated on plans, specifications, and standard drawings, compete and ready-for-use. This item shall also include allowing for utility owner inspector to inspect the existing fire hydrant prior to reuse, contractor returning unusable fire hydrants to the utility owner warehouse and picking up a replacement hydrant for use if the existing fire hydrant is determined unfit for reuse. No additional payment will be made for rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W FIRE HYDRANT REMOVE This item includes removal of an abandoned fire hydrant, isolating valve, and valve box, to the satisfaction of the engineer. The removed fire hydrant, isolating valve, and valve box shall become the property of the contractor for his disposal as salvage or scrap. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W FLUSH HYDRANT ASSEMBLY This item shall include the flushing hydrant assembly, service line, tapping the main, labor, equipment, excavation, backfill, and restoration required to install the flush hydrant at the location shown on the plans and in accordance with the specifications and standard drawings, complete and ready-for-use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W FLUSHING ASSEMBLY This item shall include the flushing device assembly, service line, meter box and lid, tapping the main, labor, equipment, excavation, backfill, and restoration required to install the flushing device at the location shown on the plans and in accordance with the specifications and standard drawings, complete and ready-for-use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W LEAK DETECTION METER This item is for payment for installation of a water meter at main valve locations, as shown on the plans, for detection of water main leaks. The meter shall be of the size and type specified in the plans or specifications. This item shall include all labor, equipment, meter, meter box or vault, connecting pipes between main and meter, main taps, tapping saddles, casting, yoke, and any other associated material needed for installation of a functioning water meter in accordance with the plans and specifications, complete and ready-for-use. No separate payment will be made under any other contract item for connecting pipe or main taps. All leak detection meters shall be paid under one bid item included in the contract, regardless of size. No separate bid items will be established for size variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete and ready for use.

W LINE MARKER This item is for payment for furnishing and installing a water utility line marker as specified by the utility owner specifications and plans. A line marker may consist of a post or monument of whatever materials specified and shall include markings and/or signage on same as specified by plans or specifications. This item shall include all labor, equipment, and materials needed for complete installation of the marker. This item shall be paid EACH (EA) when complete.

W LINE STOP SIZE 1 OR 2 This item shall include the line stop saddle/sleeve, valve, completion plug and any other material, labor, and equipment necessary to complete the line stop as indicated in the plans and/or specifications. This installation shall allow the waterline system to operate as usual without any interruption of service. The size shall be the measured internal diameter of the live pipe to be tapped. The line stop size to be paid under sizes 1 or 2 shall be as follows:
Size 1 = All live tapped main sizes up to and including 8 inches
Size 2 = All live tapped main sizes greater than 8 inches
Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W MAIN POINT RELOCATE This item is intended for payment for horizontal and/or vertical relocation of a short length of an existing main at the location shown on the plans. This bid item is to be used to relocate an existing water main at point locations, such as to clear a conflict at a proposed drainage structure, pipe, or any other similar short relocation situation, and where the existing pipe material is to be reused. The contractor shall provide any additional pipe or fitting material needed to complete the work, as shown on the plans and specifications. The materials provided shall be of the same type and specifications as those that exist. Substitution of alternative materials shall be approved by the engineer in advance on a case-by-case basis. New polyethylene wrap is to be provided (if wrap exists or is specified in the specifications to be used). If it is necessary that the pipe be disassembled for relay, payment under this item shall also include replacement of joint gaskets as needed. Bedding and backfill shall be provided and performed the same as with any other pipe installation as detailed in the plans and specifications. Payment under this item shall be for each location requiring an existing main to be relocated horizontally or vertically, regardless of pipe size or relocation length. No separate pay items will be established for pipe size variations or relocation segment length variations. Water Main Relocate shall not be paid on a linear feet basis but shall be paid EACH (EA) at each location when complete and placed in service. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced.

W METER This item is for payment for installation of all standard water meters of all sizes 2 inches in diameter or less as specified on the plans. This item shall include all labor, equipment, meter, meter box, casting, yoke, and any other associated materials needed for installation of a functioning water meter, in accordance with the plans and specifications, complete and ready-for-use. This item shall include connections to the new or existing water service line. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W METER ADJUST This item includes all labor, equipment, excavation, materials, backfill, restoration, etc., to adjust the meter casting to finished grade (whatever size exists) at the location shown on the plans or as directed, in accordance with the specifications and standard drawings, complete and ready-for-use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W METER RELOCATE This item includes all labor, equipment, excavation, additional fittings, disinfection, testing, restoration, etc., to relocate the existing water meter (whatever size exists), meter yoke, meter box, casting, etc., from its old location to the location shown on the plans or as directed, in accordance with the specifications and standard drawings, complete and ready-for-use. The new service pipe (if required) will be paid under the short side or long side service bid item. Any and all meter relocations of 2 inches or less shall be paid under one bid item included in the contract, regardless of size. Each individual relocation shall be paid individually under this item; however, no separate bid items will be established for meter size variations of 2 inches in diameter or less. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W METER VAULT SIZE RANGE 1 OR 2 This item is for payment for installation of an underground structure for housing of a large water meter, fittings, and valves as required by the plans and specifications. This item shall include all labor, equipment, excavation, concrete, manhole castings or access doors, the specified meter(s) valve(s), all piping, and fitting materials associated with installing a functioning meter and vault in accordance with the plans, standard drawings, and specifications, complete and ready-for-use. The size shall be the measured internal diameter of the meter and piping to be installed. The size meter vault to be paid under size 1 or 2 shall be as follows:

Size Range 1 = All meter and piping sizes greater than 2 inches up to and including 6 inches
Size Range 2 = All meter and piping sizes greater than 6 inches

This item shall be paid EACH (EA) when complete. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced.

W METER/FIRE SERVICE COMBO VAULT This item is for payment for installation of an underground structure for housing of a water meter and fire service piping, fittings, and valves as required by the plans and specifications. This item shall include all labor, equipment, excavation, concrete, manhole castings or access doors, the specified meter(s), valve(s), all piping, and fitting materials associated with installing a functioning meter and fire service vault, in accordance with the plans and specifications, complete and ready-for-use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W METER WITH PRESSURE REDUCING VALVE (PRV) This item is for payment for installation of all standard water meters with pressure reducing valves (PRV) of all sizes 2 inches in diameter or less,

as specified on the plans. This item shall include all labor, equipment, meter, PRV, meter box, casting, yoke, and any other associated materials needed for installation of a functioning water meter with PRV, in accordance with the plans and specifications, complete and ready-for-use. This item shall include connections to the new or existing water service line. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W PIPE This item shall apply to all pipe of every size and type material to be used as water main, except those bid items defined as "Special". This item includes the pipe specified by the plans and specifications, all fittings (including, but not limited to, bends, tees, reducers, plugs, and caps), tracing wire with test boxes (if required by specifications), polyethylene wrap (when specified), labor, equipment, excavation, bedding, backfill, restoration, testing, sanitizing, etc., required to install the specified new pipe and new fittings at the locations shown on the plans, or as directed, in accordance with the specifications and standard drawings, complete and ready-for-use. No additional payment will be made for rock excavation. This bid item includes material and placement of flowable fill under existing and proposed pavement, and wherever else specified on the plans or in the specifications. This item shall include all temporary and permanent materials, as well as equipment required to pressure test and sanitize mains including, but not limited to, pressurization pumps, hoses, tubing, gauges, main taps, saddles, temporary main end caps or plugs and blocking, main end taps for flushing, chlorine liquids or tablets for sanitizing, water for testing/sanitizing and flushing (when not supplied by the utility), chlorine neutralization equipment and materials, and any other items needed to accomplish pressure testing and sanitizing the main installation. This item shall also include pipe anchors at each end of polyethylene pipe runs, when specified to prevent the creep or contraction of the pipe. When owner specifications require, this bid item shall include contractor preparation of as-built drawings to be provided to the engineer and/or utility owner at the end of construction. Measurement of quantities under this item shall be through fittings, encasements, and directional bores (only when a separate carrier pipe is specified within the directional bore pipe). Measurements shall be further defined to be to the center of tie-in where new pipe contacts existing pipe at the center of connecting fittings, to the outside face of vault or structure walls, or to the point of main termination at dead ends. No separate payment will be made under pipe items when the directional bore pipe is the carrier pipe. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

W PLUG EXISTING MAIN This item shall include the specified plug, concrete blocking and/or mechanical anchoring, labor, equipment, excavation, backfill, and restoration required to install the plug on an existing main to be left in service at the location shown on the plans or as directed, in accordance with the specifications. This item is not to be paid to plug new main installations or mains that are to be abandoned. This pay item is only to be paid to plug existing mains that are to be left in service. Plugs on new mains are to be considered incidental to the new main, as are other fittings, and are not to be paid under this item. All plugs on existing mains left in service shall be paid under this one bid item included in the contract, regardless of size. No separate bid items will be established for size variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

Plugging of existing abandoned mains shall be performed and paid in accordance with Section 708.03.05 of KYTC Standard Specifications for Road and Bridge Construction, using Bid code 01314, Plug Pipe.

W PRESSURE REDUCING VALVE This item shall apply to all pressure reducing valves (PRV) of every size required in the plans and specifications, except those bid items defined as "Special". Payment under this description is to be for PRVs being installed with new main. This item includes the PRV as specified in the plans and specifications, polyethylene wrap (if required by specification), labor, equipment, excavation, anchoring (if any), pit or vault, backfill, restoration, testing, disinfection, etc., required to install the specified PRV at the location shown on the plans, in accordance with the specifications and standard

drawings, complete and ready-for-use. If required on the plans and/or proposed adjoining DIP is restrained, PRVs shall be restrained. PRV restraint shall be considered incidental to the PRV and adjoining pipe. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W PUMP STATION This item is for payment for installation of pumps and an above or below ground structure for housing of the pumps. This item shall include all pumps, piping, fittings, valves, electrical components, building materials, concrete, any other appurtenances, labor, equipment, excavation, and backfill, to complete the pump station installation as required by the plans, standard drawings, and specifications, complete and ready-for-use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LUMP SUM (LS) when complete.

W REMOVE TRANSITE (AC) PIPE This item shall include all labor, equipment, and materials needed for removal and disposal of the pipe as hazardous material. All work shall be performed by trained and certified personnel, in accordance with all environmental laws and regulations.
Any and all transite AC pipe removed shall be paid under one bid item included in the contract, regardless of size. No separate bid items will be established for size variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

W SERVICE LONG SIDE This item shall apply to all service line installations of every size bid up to and including 2-inch inside diameter, except those service bid items defined as "Special". This item includes the specified piping material, main tap, tapping saddle (if required), corporation stop materials, coupling for connecting the new piping to the surviving existing piping, encasement of 2 inches or less internal diameter (if required by plans or specifications), labor, equipment, excavation, backfill, testing, disinfection, and restoration, at the locations shown on the plans or as directed, in accordance with the specifications and standard drawings, complete and ready-for-use. This bid item is to pay for service installations where the ends of the service connection are on opposite sides of the public roadway and the service line crosses the centerline of the public roadway, as shown on the plans. The length of the service line is not to be specified. Payment under this item shall not be restricted by a minimum or maximum length. The contractor shall draw his own conclusions as to the length of piping that may be needed. Payment under this item shall include boring, jacking, or excavating across the public roadway for placement. Placement of a service across a private residential or commercial entrance alone shall not be reason to make payment under this item. Private or commercial entrances shall not be considered a public roadway in defining payment under this item. This pay item does not include installation or relocation of meters. Meters will be paid separately. No additional payment will be made for rock excavation or for special bedding required in rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W SERVICE SHORT SIDE This item shall apply to all service line installations of every size up to and including 2-inch internal diameter, except those service bid items defined as "Special". This item includes installation of the specified piping material of the size specified on plans, encasement of 2 inches or less internal diameter (if required by plans or specifications), main tap, tapping saddle (if required), corporation stop, coupling for connecting the new piping to the surviving existing piping, labor, equipment, excavation, backfill, testing, disinfection, and restoration at the locations shown on the plans or as directed, in accordance with the specifications and standard drawings, complete and ready-for-use. This bid item is to pay for service installations where both ends of the service connection are on the same side of the public roadway, or when an existing service crossing a public roadway will remain and is being extended, reconnected, or relocated, with all work on one side of the public roadway centerline as shown on the plans. The length of

the service line is not to be specified and shall not be restricted to any minimum or maximum length. Placement of a service lateral across a private residential or commercial entrance alone shall not be reason to make payment under this item. Private or commercial entrances shall not be considered a public roadway in defining payment under this item. The contractor shall draw his own conclusions as to the length of piping that may be needed. This pay item does not include installation or relocation of meters. Meters will be paid separately. No additional payment will be made for rock excavation or for bedding required in rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W SERVICE RELOCATE This item is for the relocation of an existing water service line where a meter is not involved, and where an existing service line can easily be adjusted by excavating alongside and moving the line horizontally and/or vertically a short distance without cutting the service line to avoid conflicts with road construction. This item shall include excavation, labor, equipment, bedding, and backfill to relocate the line, in accordance with the plans and specifications, complete and ready-for-use. Payment under this item shall be for each location requiring relocation. Payment shall be made under this item regardless of service size or relocation length. No separate pay items will be established for size or length variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W STRUCTURE ABANDONMENT This item is to be used to pay for abandonment of larger above or below ground water structures such as meter vaults, fire pits, pump stations, tanks, etc. Payment under this item shall not be limited to size or scope; however, structures with connecting pipes of 2 inches or less shall not be paid under this item but shall be considered incidental to water construction (i.e., abandonment of standard water meters up to and including 2 inches would not be paid under this item). Payment under this item shall include all labor, equipment, and compacted fill or flowable fill for abandonment of the structure in-place and complete restoration. No separate bid items will be established for size or structure variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W STRUCTURE REMOVAL This item is to be used to pay for removal of larger above or below ground water structures such as meter vaults, fire pits, pump stations, tanks, etc. Payment under this item shall not be limited to size or scope; however, structures with connecting pipes of 2 inches or less shall not be paid under this item but shall be considered incidental to water construction (i.e., removal of standard water meters up to and including 2 inches would not be paid under this item). Payment under this item shall include all labor, equipment, and compacted backfill for removal of the structure and complete restoration. No separate bid items will be established for size or structure variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W TAPPING SLEVE AND VALVE SIZE 1 OR 2 This item shall include the specified tapping sleeve, valve, valve box, concrete pad around valve box (when required in specifications or plans), labor, and equipment to install the specified tapping sleeve and valve, complete and ready-for-use, in accordance with the plans and specifications. The size shall be the measured internal diameter of the live pipe to be tapped. The size tapping sleeve and valve to be paid under sizes 1 or 2 shall be as follows:

Size 1 = All live tapped main sizes up to and including 8 inches
Size 2 = All live tapped main sizes greater than 8 inches

Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W TIE-IN This item shall be used for all main tie-in bid items of every size, except those defined as "Special". This item includes all labor, equipment, excavation, fittings, sleeves, reducers, couplings, blocking, anchoring, restoration, disinfection, testing, and backfill required to make the water main tie-in as shown on the plans and in accordance with the specifications, complete and ready-for-use. Pipe for tie-ins shall be paid under separate bid items. This item shall be paid EACH (EA) when complete.

Plugging of existing abandoned mains shall be performed and paid in accordance with Section 708.03.05 of KYTC Standard Specifications for Road and Bridge Construction, using Bid code 01314, Plug Pipe.

W VALVE This item shall apply to all valves of every size required in the plans and specifications, except those bid items defined as "Special". Payment under this description is to be for gate or butterfly valves being installed with new main. This item includes the valve as specified in the plans and specifications, polyethylene wrap (if required by specifications), labor, equipment, excavation, anchoring (if any), valve box and valve stem extensions, backfill, concrete pad around valve box (if required by specifications), restoration, testing, disinfection, etc., required to install the specified valve at the location shown on the plans, in accordance with the specifications and standard drawings, complete and ready-for-use. If required on plans and/or proposed adjoining DIP is restrained, valves shall be restrained. Valve restraint shall be considered incidental to the valve and adjoining pipe. This description does not apply to cut-in valves. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W VALVE ANCHOR EXISTING This item is intended to pay for installation of restraint hardware on an existing valve where no restraint exists, to hold the valve in place to facilitate tie-ins and other procedures where restraint is prudent. This work shall be performed in accordance with water specifications and plans. This bid item shall include all labor, equipment, excavation, materials, and backfill to complete restraint of the designated valve, regardless of size, at the location shown on the plans, complete and ready-for-use. Materials to be provided may include, but are not limited to, retainer glands, lugs, threaded rod, concrete, reinforcing steel, or any other material needed to complete the restraint. Should the associated valve box require removal to complete the restraint, the contractor shall reinstall the existing valve box, the cost of which shall be considered incidental to this bid item. No separate bid items are being provided for size variations. All sizes shall be paid under one bid item. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W VALVE BOX ADJUST This item include all labor, equipment, valve box and valve stem extensions (if required), excavation, backfill, concrete pad around valve box (when specified in specifications or plans), restoration, etc., to adjust the top of the box to finished grade, complete and ready-for-use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W VALVE BOX REMOVE This item is in payment for all labor, equipment, restoration materials, disposal, and any other effort for removal of a valve box, leaving the valve in place. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W VALVE CUT-IN This item is for new cut-in valve installations of all sizes, where installation is accomplished by cutting out a section of existing main. This item shall include cutting the existing pipe, supplying the specified valve, couplings or sleeves, valve box, concrete pad around valve box (when required in specifications or plans), labor, equipment, and materials to install the valve at the locations

shown on the plans, or as directed by the engineer, complete and ready-for-use. Any pipe required for installation shall be cut from that pipe removed or supplied new by the contractor. No separate payment will be made for pipe required for cut-in valve installation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W VALVE REMOVE This item is in payment for all labor, equipment, and restoration materials for cutting of existing pipe and any other effort necessary for total removal of an existing valve and valve box. This bid item shall include disposal of the valve and box, unless plans or specifications state the valve and box are to be salvaged and delivered to the utility owner for reuse. No separate pay items are to be established for size variations. All valve removals, regardless of size, shall be paid under this one pay item. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.
If plugging of existing abandoned mains is needed after valve removal, the work shall be performed and paid in accordance with Section 708.03.05 of KYTC Standard Specifications for Road and Bridge Construction, using Bid code 01314, Plug Pipe.

W VALVE VAULT This item is for payment for installation of an underground structure for housing of specific valve(s), as required by the plans and specifications. This item shall include all labor, equipment, excavation, concrete, manhole castings or doors, the specified valve(s), all piping, and fitting materials associated with installing a functioning valve vault, in accordance with the plans, standard drawings, and specifications, complete and ready-for-use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

SECTION 013323 – SHOP DRAWINGS, PRODUCT DATA, SAMPLES AND RFIs

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. General: This section specifies procedural requirements for non- administrative submittals including shop drawings, product data, samples (when samples are specifically requested) and other miscellaneous work-related submittals. Shop drawings, product data, samples and other work-related submittals are required to amplify, expand and coordinate the information contained in the Contract Documents.

B. Refer to other Division 01 sections and other Contract Documents for Specifications on administrative, non-work-related submittals. Such submittals include, but are not limited to the following items:

1. Permits.
2. Payment applications.
3. Performance and payment bonds.
4. Insurance certificates.
5. Inspection and test reports.
6. Schedule of values.
7. Progress reports.
8. Listing of subcontractors.
9. Operating and Maintenance Manuals

C. Engineer prefers initial submittals be in electronic media along with one paper copy for review. Engineer utilizes Newforma software and will provide Contractor with the necessary links and instructions for submittal purposes. Upon completion of the review process, Contractor shall print two copies of complete submittal, including transmittal cover page and stamp page, and deliver to Engineer.

If Contractor does not have capability to submit electronic submittals, then Contractor shall submit a request to Engineer for waiver. In the event a waiver is granted, paper submittals shall be provided as directed by the Engineer.

D. Submittals shall be checked and reviewed by the Contractor and stamped with Contractor's review stamp before submission to the Engineer. The review of the submittals by the Engineer shall not be construed as a complete check but will indicate only that the general method of construction and detailing is satisfactory. Review of such submittals will not relieve the Contractor of the responsibility for any errors which may exist as the Contractor shall be responsible for the dimensions and design of adequate connections, details, and satisfactory construction of all work.

E. All Requests for Information (RFI) to Engineer shall be submitted electronically via Engineer's Newforma software.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-01 Specification sections, apply to work of this section.

B. Section 017823 - Operating and Maintenance Manuals.

1.3 DEFINITIONS

A. Shop drawings are technical drawings and data that have been specially prepared for this project, including but not limited to the following items:

1. Fabrication and installation drawings.
2. Setting diagrams.
3. Shopwork manufacturing instructions.
4. Templates.
5. Patterns.
6. Coordination drawings (for use on site).
7. Schedules.
8. Design mix formulas.
9. Contractor's engineering calculations.

Standard information prepared without specific reference to a project is not considered to be shop drawings.

B. Product data includes standard printed information on manufactured products that has not been specially-prepared for this project, including but not limited to the following items:

1. Manufacturer's product specifications and installation instructions.
2. Standard color charts.
3. Catalog cuts.
4. Roughing-in diagram and templates.
5. Standard wiring diagrams.
6. Printed performance curves.
7. Operational range diagrams.
8. Mill reports.
9. Standard product operating and maintenance manuals.

C. Samples, where specifically required, are physical examples of work, including but not limited to the following items:

1. Partial sections of manufactured or fabricated work.
2. Small cuts or containers of materials.
3. Complete units of repetitively used materials.
4. Swatches showing color, texture and pattern.
5. Color range sets.
6. Units of work to be used for independent inspection and testing.

D. Miscellaneous submittals are work-related, non-administrative submittals that do not fit in the three previous categories, including, but not limited to the following:

1. Specially prepared and standard printed warranties.
2. Maintenance agreements.
3. Workmanship bonds.
4. Survey data and reports.
5. Testing and certification reports.
6. Record drawings.
7. Field measurement data.

1.4 SUBMITTAL PROCEDURES

A. General: Refer to the General Conditions and Paragraph 1.1 hereinbefore for basic requirements for submittal handling.

B. Coordination: Coordinate the preparation and processing of submittals with the performance of the work. Coordinate each separate submittal with other submittals and related activities such as testing, purchasing, fabrication, delivery and similar activities that require sequential activity.

1. It is the Contractor's responsibility to make such field measurements as are needed to base submittals on actual field conditions to assure proper connection, fit, function and performance of all work and equipment in the execution of the contract work.
2. Coordinate the submittal of different units of interrelated work so that one submittal will not be delayed by the Architect/Engineer's need to review a related submittal. The Architect/Engineer reserves the right to withhold action on any submittal requiring coordination with other submittals until related submittals are forthcoming.

C. Coordination of Submittal Times: Prepare and transmit each submittal to the Architect/Engineer sufficiently in advance of the scheduled performance of related work and other applicable activities. Transmit different kinds of submittals for the same unit of work so that processing will not be delayed by the Architect/Engineer's need to review submittals concurrently for coordination.

D. Review Time: Allow sufficient time so that the installation will not be delayed as a result of the time required to properly process submittals, including time for resubmittal, if necessary. Advise the Architect/Engineer on each submittal, as to whether processing time is critical to the progress of the work and if the work would be expedited if processing time could be shortened.

1. Allow a longer time period where processing must be delayed for coordination with subsequent submittals. The Architect/Engineer will advise the Contractor promptly when it is determined that a submittal being processed must be delayed for coordination.
2. No extension of time will be authorized because of the Contractor's failure to transmit submittals to the Architect/Engineer sufficiently in advance of the work.

E. Submittal Preparation: Mark each submittal with a permanent label for identification. Provide the following information on the label for proper processing and recording of action taken.

1. Project name.
2. Date.
3. Name and address of Architect/Engineer.
4. Name and address of Contractor.
5. Name and address of subcontractor.
6. Name and address of supplier.
7. Name of manufacturer.
8. Number and title of appropriate specification section.
9. Drawing number and detail references, as appropriate.
10. Similar definitive information as necessary.

F. All submittals shall be referenced to the applicable item, section and division of the Specifications, and to the applicable drawing(s) or drawing schedule(s). Include only one item in a submittal.

G. The Contractor shall review and check submittals and shall indicate their review by initials and date. Any submittal received without this evidence of review shall be returned to the Contractor without review.

H. If the submittals deviate from the Contract Drawings and/or Specifications, the Contractor shall advise the Engineer in writing of the deviation and the reasons therefore.

I. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the Architect/Engineer, and to other destinations as indicated, by use of a transmittal form. Submittals received from sources other than the Contractor will be returned to the sender "without action".

J. Electronic Submittals: If the electronic method of submittals is agreed to by Contractor, Engineer, and Owner, the format and procedures will be determined and implemented prior to any submittals. Submittals will be processed through "Newforma" software. Each item of the submittal documents shall be in .pdf format and shall be oriented so that they are read from upper left corner to lower right corner, with no rotation of said document being required after receiving it. The .pdf file shall be named so that it describes the item being submitted. All other requirements herein are part of the electronic submittal process with the exception of the duplicate copies. Contractor stamp indicating review and any comments or notes must be on the .pdf submittal.

1.5 SPECIFIC SUBMITTAL REQUIREMENTS

A. Shop drawings shall be prepared by a qualified detailer. Details shall be identified by reference to sheet and detail numbers shown on Contract Drawings. Where applicable, show fabrication, layout, setting and erection details.

Shop drawings are defined as original drawings prepared by the Contractor, subcontractors, suppliers, or distributors performing work under this Contract. Shop drawings illustrate some portion of the work and show fabrication, layout, setting or erection details of equipment, materials and components. The Contractor shall, except as otherwise noted, have prepared the number of reviewed copies required for their distribution plus four which will be retained by the Engineer. Shop drawings shall be folded to an approximate size of 8.5 inches by 11 inches and

in such manner that the title block will be located in the lower right-hand corner of the exposed surface.

B. Project data shall include manufacturer's standard schematic drawings modified to delete information which is not applicable to the project, and shall be supplemented to provide additional information applicable to the project. Each copy of descriptive literature shall be clearly marked to identify pertinent information as it applies to the project.

C. Where samples are required, they shall be adequate to illustrate materials, equipment or workmanship, and to establish standards by which completed work is judged. Provide sufficient size and quantity to clearly illustrate functional characteristics of product and material, with integrally related parts and attachment devices, along with a full range of color samples.

D. In the event the Engineer does not specifically reject the use of material or equipment at variance to that which is shown on the Drawings or specified, the Contractor shall, at no additional expense to the Owner, and using methods reviewed by the Engineer, make any changes to structures, piping, controls, electrical work, mechanical work, etc., that may be necessary to accommodate this equipment or material. Should equipment other than that on which design drawings are based be accepted by the Engineer, shop drawings shall be submitted detailing all modification work and equipment changes made necessary by the substituted item.

E. Additional information on particular items, such as special drawings, schedules, calculations, performance curves, and material details, shall be provided when specifically requested in the technical Specifications.

F. Submittals for all electrically operated items (including instrumentation and controls) shall include complete size, color coding, all terminations and connections, and coordination with related equipment.

G. Equipment shop drawings shall indicate all factory or shop paint coatings applied by suppliers, manufacturers and fabricators; the Contractor shall be responsible for ensuring the compatibility of such coatings with the field-applied paint products and systems.

H. Fastener specifications of manufacturer shall be indicated on equipment shop drawings.

I. Where manufacturers brand names are given in the Specifications for building and construction materials and products, such as grout, bonding compounds, curing compounds, masonry cleaners, waterproofing solutions and similar products, the Contractor shall submit names and descriptive literature of such materials and products he proposes to use in this Contract.

J. No material shall be fabricated or shipped unless the applicable drawings or submittals have been reviewed by the Engineer and returned to the Contractor.

K. All bulletins, brochures, instructions, parts lists, and warranties package with and accompanying materials and products delivered to and installed in the project shall be saved and transmitted to the Owner through the Engineer.

1.6 REVIEW STATUS

A. Submittals will be returned, stamped with the following classifications: "Reviewed", "Furnish as Corrected", "Revise and Resubmit", "Rejected", or "Submit Specified Item".

B. In some instances, corrections to dimensions or clarification notations will be required, in which case the drawings will be marked "Furnish as Corrected." These shop drawings will not be required to be resubmitted for further approval. If the supplier makes additional modifications after receiving a "Furnish as Corrected" disposition, the drawings must then be resubmitted for review.

C. If the shop drawing is returned with the notation "Revise and Resubmit", the Contractor shall promptly make the revisions indicated and repeat the submittal approval procedure.

D. If the shop drawing is returned with the notation "Submit Specified Item", this indicates that the submittal does not meet the specification, will not be reviewed, and is unacceptable. Upon return of a drawing so marked, the Contractor shall repeat the initial approval procedure, submitting acceptable materials or equipment.

E. The "Rejected" notation is used to indicate materials or equipment that are not acceptable and are not included in the project.

1.7 REMINDER OF CONTRACTOR RESPONSIBILITIES

A. Verify field measurements, field construction criteria, catalog numbers, and similar data.

B. Coordinate each submittal with requirements of work and of Contract Documents.

C. Notify Engineer, in writing at time of submission, of deviations in submittals from requirements of Contract Documents.

D. Begin no work, and have no material or products fabricated or shipped which requires submittals until return of submittals with Engineer's stamp and initials or signature indicating review.

E. Upon review and closeout of a submittal, Contractor shall print two copies of complete submittal, including transmittal cover page and stamp page, and deliver to Engineer.

F. It is emphasized that the review of shop drawings by the Engineer is for general conformance to the Contract Drawings and Specifications, but subject to the detailed requirements of the Contract Drawings and Specifications. Although the Engineer may check submitted data in more or less detail, such checking is an effort to discover errors and omissions in the Contractor's drawings and to assist the Contractor in coordinating and expediting their work, but shall in no way relieve the Contractor of their obligation and responsibility to properly coordinate the work, and to Engineer the details of the work in such a manner, that the purpose and intent of the Contract will be achieved nor shall any such detailed checking by the Engineer be construed as placing on him or on the Owner, any responsibility for the accuracy, proper fit, functioning or performance of any phase of the work included in this Contract. The Contractor is responsible for confirmation and correlation of dimensions at the job site; for information that pertains solely to the fabrication processes or to the techniques of construction; for the coordination of the work of all trades; and for performance of their work in a safe and satisfactory manner.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 013323

SECTION 014500 – QUALITY CONTROL SERVICES - LINE PROJECT

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. Required inspection and testing services are intended to assist in the determination of probable compliance of the Work with requirements specified or indicated. These required services do not relieve the Contractor of responsibility for compliance with these requirements or for compliance with requirements of the Contract Documents.

B. 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.

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

D. 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 or tests to be conducted at the field shall be done in the presence of the Engineer or the Engineer's representative.

E. Certifications by independent testing laboratories may be by copy of the attest 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.

F. Inspections, tests and related actions specified in this section and elsewhere in the Contract Documents are not intended to limit the Contractor's own quality control procedures which facilitate overall compliance with requirements of the Contract Documents.

1.2 RELATED DOCUMENTS

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

1.3 SUBMITTALS

A. General: Refer to Section 013323 for the general requirements on submittals. Submit a certified written report of each inspection, test or similar service, directly to the Architect/Engineer.

B. Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to the following:

1. Name of testing agency or test laboratory.
2. Dates and locations of samples and tests or inspections.
3. Names of individuals making the inspection or test.
4. Designation of the work and test method.
5. Complete inspection or test data.

6. Test results.
7. Interpretations of test results.
8. Notation of significant ambient conditions at the time of sample-taking and testing.
9. Comments or professional opinion as to whether inspected or tested work complies with requirements of the Contract Documents.
10. Recommendations on retesting, if applicable.

1.4 RESPONSIBILITIES

A. Contractor Responsibilities: Except where they are specifically indicated as being the Owner's responsibility, or where they are to be provided by another identified entity, inspections, tests and similar quality control services are the Contractor's responsibility; these services also include those specified to be performed by an independent agency and not directly by the Contractor. Costs for these services shall be included in the Contract Sum. The Contractor shall employ and pay an independent agency, testing laboratory or other qualified firm to perform quality control services specified.

B. Retest Responsibility: Where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance of related Work with the requirements of the Contract Documents, then retests are the responsibility of the Contractor, regardless of whether the original test was the Contractor's responsibility. Retesting of work revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original Work.

C. Responsibility for Associated Services: The Contractor is required to cooperate with the independent performing required inspections, tests and similar services. Provide such auxiliary services as are reasonably requested. Notify the testing agency sufficiently in advance of operations to permit assignment of personnel. These auxiliary services include but are not necessarily limited to the following:

1. Providing access to the work.
2. Taking samples or assistance with taking samples.
3. Delivery of Samples to test laboratories.
4. Delivery and protection of samples and test equipment at the project site.

D. Coordination: The Contractor and each independent agency engaged to perform inspections, tests and similar services for the project shall coordinate the sequence of their activities so as to accommodate required services with a minimum of delay in the progress of the Work. In addition, the Contractor and each independent testing agency shall coordinate their Work so as to avoid the necessity of removing and replacing Work to accommodate inspections and tests. The Contractor is responsible for scheduling times for inspections, tests, taking of samples and similar activities.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. Upon completion of inspection, testing, sample taking, and similar services performed on the Work, repair damaged work and restore substrates and finishes to eliminate deficiencies, including deficiencies in the visual qualities of exposed finishes. Comply with the Contract Document requirements for "Cutting and Patching". Protect Work exposed by or for quality control service activities and protect repaired work. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION 014500

SECTION 017400 – CLEANING

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. Maintain premises free from accumulations of waste, debris, and rubbish.

B. At completion of work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all exposed surfaces. Leave project clean and ready for occupancy.

1.2 RELATED DOCUMENTS

A.	Cutting and Patching	Section 017329
B.	Project Closeout:	Section 017700.
C.	Cleaning for Specific Products of Work:	Specification Section for that work.

1.3 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 violative noxious substances.

B. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

1. Do not burn or bury rubbish and waste materials on project site.
2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
3. Do not dispose of wastes into streams or waterways.

PART 2 - PRODUCTS

2.1 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

3.1 DURING CONSTRUCTION

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

B. Wet down dry materials and rubbish to lay dust and prevent 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 Owner's property.

F. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.

G. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.

3.2 FINAL CLEANING

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

B. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.

C. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials, from sight-exposed interior or exterior finished surfaces; polish surfaces so designated to shine finish.

D. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.

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

F. Maintain cleaning until project, or portion thereof, is occupied by Owner.

END OF SECTION 017400

SECTION 017700 – PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

A. Project Record Documents: Section 017839.

1.2 SUBSTANTIAL COMPLETION

A. In order to initiate project closeout procedures, the Contractor shall submit the following:

1. Written certification to Engineer that project is Substantially Complete.
2. List of major items to be completed or corrected.

B. Engineer will make an inspection within 7 days after receipt of certification, together with Owner's Representative.

C. Should Engineer consider that work is Substantially Complete:

1. Contractor shall prepare, and submit to Engineer, a list of items to be completed or corrected, as determined by the inspection.
2. Engineer will prepare and issue a Certificate of Substantial Completion, containing:

a. Date of Substantial Completion.
b. Contractor's list of items to be completed or corrected, verified and amended by Engineer.
c. The time within which Contractor shall complete or correct work of listed items.
d. Time and date Owner will assume possession of work or designated portion thereof.
e. Responsibilities of Owner and Contractor for:

1) Insurance
2) Utilities
3) Operation of Mechanical, Electrical, and Other Systems.
4) Maintenance and Cleaning.
5) Security.

f. Signatures of:

1) Engineer
2) Contractor
3) Owner

3. Owner occupancy of Project or Designated Portion of Project:

a. Contractor shall:

1) Obtain certificate of occupancy.
2) Perform final cleaning in accordance with Section 017400.

b. Owner will occupy Project, under provisions stated in Certificates of Substantial Completion.

4. Contractor: Complete work listed for completion or correction, within designated time.

D. Should Engineer consider that work is not Substantially Complete:

1. He shall immediately notify Contractor, in writing, stating reasons.
2. Contractor: Complete work, and send second written Engineer, certifying that Project, or designated portion of Project is substantially complete.
3. Engineer will reinspect work.

E. Should Engineer consider that work is still not finally complete:

1. He shall notify Contractor, in writing, stating reasons.
2. Contractor shall take immediate steps to remedy the stated deficiencies and send third written notice to the Engineer certifying that the work is complete.
3. Engineer and Owner will reinspect work at Contractor's expense.

1.3 FINAL INSPECTION

A. Contractor shall submit written certification that:

1. Contract Documents have been reviewed.
2. Project has been inspected for compliance with Contract Documents.
3. Work has been completed in accordance with Contract Documents.
4. Equipment and systems have been tested in presence of Owner's Representative and are operational.
5. Project is completed, and ready for final inspection.

B. Engineer will make final inspection within seven days after receipt of certification.

C. Should Engineer consider that work is finally complete in accordance with requirements of Contract Documents, Engineer shall request Contractor to make Project Closeout submittals.

D. Should Engineer consider that work is not finally complete:

1. He shall notify Contractor in writing, stating reasons.
2. Contractor shall take immediate steps to remedy the stated deficiencies and send second written notice to Engineer certifying that work is complete.
3. Engineer will reinspect work.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: To requirements of Section 017839.

B. Guarantees, Warranties and Bonds: To requirements of particular technical Specifications and Section 017834.

1.5 INSTRUCTION

A. Instruct Owner's personnel in operation of all systems, mechanical, electrical, and other equipment.

1.6 FINAL APPLICATION FOR PAYMENT

A. Contractor shall submit final applications in accordance with requirements of General Conditions.

1.7 FINAL CERTIFICATE FOR PAYMENT

A. Engineer will issue final certificate in accordance with provisions of general conditions.

B. Should final completion be materially delayed through no fault of Contractor, Engineer may issue a Semi-Final Certificate for Payment.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 017700

SECTION 017823 – OPERATIONS AND MAINTENANCE MANUALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Compile product data and related information appropriate for Owner's maintenance and operation of equipment furnished under the Contract. Prepare operating and maintenance data as specified.

B. In addition to maintenance and operations data, the manufacturer's printed recommended installation practice shall also be included. If not part of the operations and maintenance manual, separate written installation instructions shall be provided, serving to assist the Contractor in equipment installation.

C. Related requirements specified elsewhere:

1.	Shop Drawings, Product Data and Samples:	Section 013323
2.	Project Closeout:	Section 017700
3.	Project Record Documents:	Section 017839
4.	Warranties and Bonds:	Section 017834

1.2 QUALITY ASSURANCE

A. Preparation of data shall be done by personnel:

1. Trained and experienced in maintenance and operation of the described products.
2. Completely familiar with requirements of this Section.
3. Skilled as a technical writer to the extent required to communicate essential data.
4. Skilled as a draftsman competent to prepare required drawings.

1.3 SUBMITTAL SCHEDULE

A. Submit one printed copy of operation and maintenance data for each item of equipment prior to 80 percent completion of the Contract. Binder is not required for Preliminary submittals. Digital submittal is **NOT** required for preliminary review.

B. Upon approval of **ALL** O&M submittal items, the complete manual shall be assembled as described in the following sections.

C. The complete, assembled Operation and Maintenance Manual shall be submitted 10 days prior to final inspection or acceptance to the Owner. Provide a total of two hard copies and one digital copy of the complete manual. Do not submit individual equipment items as final O&M manuals. The final submittal shall be the COMPLETE assembled manual, with a master table of contents included.

1.4 FORM OF SUBMITTALS

A. Format: Preliminary submittals may be made of each individual item of equipment. The final O & M Manual shall be assembled by combining the individual equipment submittals in one or more 3-ring binder(s). Large equipment operating and maintenance instructions may be contained in their individual binder(s). Smaller O&M instructions shall be assembled in a binder, with the sections separated by a tabbed divider page, and a table of contents.

1. Size: 8.5 inches x 11 inches.
2. Paper: 20 lb. minimum, white, for typed pages.
3. Text: Manufacturer's printed data, or neatly typewritten.
4. Photocopies must be clear and legible.
5. Drawings:

    a. Provide reinforced punched binder tab, bind in with text.
    b. Fold large drawings to the size of the text pages where feasible.
    c. For flow or piping diagrams that cannot be detailed on the standard size drawings, a larger, appropriate size drawing may be submitted and supplied in a properly marked map packet.

6. Provide fly-leaf for each separate product, or each piece of operating equipment.

    a. Provide typed description of product, and major component parts of equipment.
    b. Provide indexed tabs.

7. Cover: Identify each volume with types or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List:

    a. Title of Project.
    b. Identity of separate structure as applicable.
    c. Identity of general subject matter covered in the manual.

C. Binders:

1. Commercial quality, durable and cleanable, three-ring binders, with oil and moisture resistant hard covers.
3. Imprinted on the front cover and side of each binder shall be the name of the treatment plant or project, the Contract Number and the title of equipment.
4. Binders shall be new and not recycled from a prior data manual.

1.5 CONTENTS OF MANUAL

A. Table of Contents: Each item shall be placed in a logical sequential order, according to the operating process of the facility as shown on the Hydraulic Profile in the Contract Drawings.

B. Content, for each unit of equipment and system, as appropriate:

1. Process Description: Detailed description of the process and operation functions as applicable.

2. Component Instructions: Instructions for all components of the equipment whether manufactured by the supplier or not, including valves, controllers and other miscellaneous components.

3. Component Data: Description of unit and component parts.

    a. Function, normal operating characteristics, and limiting conditions.
    b. Performance curves, engineering data and tests.
    c. Complete nomenclature and commercial number of all replaceable parts.
    d. Exploded and/or sectional drawing views.
    e. Piping diagrams numbered to correspond to the installation.
    f. Equipment model number and serial number.

4. Control and Wiring Diagrams:

    a. Internal and external wiring diagrams numbered to correspond to the installation.
    b. Control circuit diagrams
    c. One-line diagrams
    d. P&ID drawings
    e. As-installed control diagrams by controls supplier.

5. Operating procedures:

    a. Startup, break-in, routine and normal operating instructions.
    b. Regulation, control, stopping, shutdown and emergency instructions.
    c. Summer and winter operating instructions.
    d. Special operating instructions.
    e. Description of sequence of operation by control supplier.

6. Maintenance Procedures:

    a. Routine operations.
    b. Guide to "trouble-shooting".
    c. Disassembly, repair and reassembly.
    d. Alignment, adjusting and checking.
    e. Equipment parts list.
    f. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.

        1) Predicted life of parts subject to wear.

    g. Local service center.

7. Lubrication and Service schedule.

    a. Preventative maintenance schedule.
    b. Component lubrication and servicing interval schedule.
    c. List of lubricants and/or filters required.
    d. Lubrication and servicing procedures.

8. Recommended spare parts list and quantities.

9. Guide to "trouble-shooting".
10. Plant specific instructions:

    a. Each Contractor's coordination drawings.
    b. As-installed color-coded piping diagrams.
    c. Detailed specific "Sequence of Operation" for the constructed plant or project.
    d. Charts of valve tag numbers, if appropriate, with the location and function of each valve.

11. Plant specific startup and shutdown procedures.
12. Detailed instructions for emergency operation
13. Other data as required under pertinent sections of Specifications.

C. Content, for each electrical system, as appropriate:

1. Description of system and component parts.

    a. Function, normal operating characteristics, and limiting conditions.
    b. Performance curves, engineering data and tests.
    c. Complete nomenclature and commercial number of replacement parts.

2. Circuit directories of panel boards.

    a. Electrical service.
    b. Controls.
    c. Communications.

3. As-installed color-coded wiring diagrams.
4. Operating procedures:

    a. Routine and normal operating instructions.
    b. Sequences required.
    c. Special operating instructions.

5. Maintenance procedures:

    a. Routine operations.
    b. Guide to "trouble-shooting".
    c. Disassembly, repair and reassembly.
    d. Adjustment and checking.

6. Manufacturer's printed operating and maintenance instructions.
7. List of original manufacturer's recommended spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

D. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.

E. Additional requirements for operating and maintenance data: The respective section of Specifications.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 017823

Manufacturer Submittals / Operation and Maintenance Manual Review Guide

Project Name:

Project Number:

Spec Section	Equipment Items	Initial Submittal Date	Format/Binder/TOC	Manufacturer Date	Process Description	Component Instructions	Operating Procedures	Maintenance Procedures	Lubrication Schedule	Plant Specific Instructions	Parts List	Spare Parts List	Troubleshooting Guide	Startup/Shutdown	Emergency Operation	Control Diagrams	Model/Serial Number	Notes

SECTION 017834 – WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. Compile specified warranties and bonds.

B. Compile specified service and maintenance contracts.

C. Co-execute submittals when so specified.

D. Review submittals to verify compliance with Contract Documents.

E. Submit to Engineer for review and transmittal to Owner. **Comply with provisions of Section 013323.**

1.2 RELATED DOCUMENTS

A. Bid Bond: Instructions to Bidders.

B. Performance and Payment Bonds: General Conditions and Supplemental General Conditions.

C. Guaranty: General Conditions and Supplemental General Conditions.

D. General Warranty of Construction: General Conditions.

E. Project Closeout: Section 017700.

F. Warranties and Bonds required for specific products: As listed in technical specifications in these Contract Documents herein.

G. Provisions of Warranties and Bonds, Duration: Respective specification sections for particular products.

1.3 SUBMITTALS REQUIREMENTS

A. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers and subcontractors.

B. Furnish two original signed copies.

C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.

1. Product, equipment or work item.

2. Firm name, address and telephone number.
3. Scope.
4. Date of beginning of warranty, bond or service and maintenance contract.
5. Duration of warranty, bond or service and maintenance contract.
6. Provide information for Owner's personnel:

    a. Proper procedure in case of failure.
    b. Instances which might affect the validity of warranty or bond.

7. Contractor name, address and telephone number.

1.4 FORM OF SUBMITTALS

A. Prepare in duplicate packets.

B. Format:

1. Size 8.5 inches x 11 inches, punch sheets for three-ring binder.

    a. Fold larger sheets to fit into binders.

2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS." List:

    a. Title of Project
    b. Name of Contractor

C. Binders: Commercial quality, three-ring, with durable and cleanable plastic covers.

1.5 TIME OF SUBMITTALS

A. For equipment or component parts of equipment put into service during progress of construction:

1. Submit documents within 10 days after inspection and acceptance.

B. Otherwise make submittals within 10 days after date of substantial completion, prior to final request for payment.

C. For items of work, where acceptance is delayed materially beyond the Date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing the date of acceptance as the start of the warranty period.

1.6 SUBMITTALS REQUIRED

A. Submit warranties, bonds, service and maintenance contracts as specified in the respective sections of the Specifications.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 017834

SECTION 017839 – PROJECT RECORD DOCUMENTS - WATER

PART 1 - GENERAL

1.1 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.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Shop Drawings, Product Data, and Samples: Section 013323.

1.3 MARKING DEVICES

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

1.4 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. Coordinate and confirm with Engineer that electronic versions of all shop drawings have been provided to Engineer.

1.5 SUBMITTALS

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 Their Authorized Representative.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 017839

DIVISION 02

EXISTING CONDITIONS

SECTION 024100 – DEMOLITION & SALVAGE

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment and services required for demolition as shown on the Drawings and specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork: Section 312000

1.3 PROCEDURE

A. The procedures proposed for the accomplishment of salvage and demolition work shall be submitted for review. The procedures shall provide for safe conduct of the work, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress and timely disconnection of utility services. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations.

B. It is the responsibility of the Contractor to visit the site to familiarize themself with the amount of Work that is included under this Section.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 DUST CONTROL

A. The amount of dust resulting from the demolition shall be controlled to prevent the spread of dust to occupied portions of the plant and to avoid creation of a nuisance in the surrounding area. Use of water will not be permitted when it will result in or create hazardous or objectionable conditions such as ice, flooding and pollution.

3.2 DISCONNECTION OF UTILITY SERVICES

A. Utilities shall be disconnected at the points indicated by the Owner or Engineer and left in a safe condition.

3.3 BURNING

A. The use of burning at the project site for the disposal of refuse and debris will not be permitted, unless authorized in writing by the Owner.

3.4 PROTECTION OF EXISTING WORK

A. Existing work to remain shall be protected from damage. Work damaged by the Contractor shall be repaired to match existing work.

3.5 BACKFILL OF STRUCTURES

A. All existing structures to be abandoned shall have equipment removed and walls demolished a minimum of two feet below finish grade. The portion of the demolished structures remaining below grade shall be backfilled with concrete, masonry, etc., from the demolition or any backfill material which is acceptable to the Engineer. The top 2 feet of the backfill shall be made up of topsoil and graded to match the existing ground. It shall be free of any of the demolition material. The entire backfill shall be compacted in such a manner as to prevent settlement.

B. All existing demolished basins shall have some method of positive drainage thru the bottom slab as approved by the Engineer.

C. It is the responsibility of the Contractor to dispose of all excess demolition material from the site as soon as practicable.

3.6 SALVAGE MATERIAL

A. All equipment, pumps, controls, valves, piping, etc., is the property of the Owner and care shall be taken in its removal so not to damage it in any way. Such salvage material shall be removed and delivered to the Owner to a site designated by the Owner. The Owner has the right to refuse any salvage material and, in such cases, it is the responsibility of the Contractor to dispose of the unwanted material.

3.7 EXISTING CHECK VALVE VAULT

A. Contractor shall remove the existing OCWD check valve vault and return the check valve and all interior appurtenances to Oldham County Water District Office located at 2160 Spencer Ct., LaGrange KY, 40031.

B. Contractor shall notify and coordinate with OCWD prior to removing and delivering check valve and interior appurtenances.

END OF SECTION 024100

DIVISION 03

CONCRETE

SECTION 033000 – CAST-IN-PLACE CONCRETE

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment, and services required to furnish and install all cast-in-place concrete as indicated on the Drawings and specified herein.

B. All concrete construction shall conform to all applicable requirements of ACI 301 (latest), Specifications for Structural Concrete for Buildings, except as modified by the supplemental requirements specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork: Section 312000

1.3 SUBMITTALS

The Contractor shall submit the following data for Engineer review in accordance with Section 013323.

A. Concrete mixture proportions, test results, and curves plotted to establish water-cementitious materials ratio if ACI 301-05 Section 4.2.3.4.b is followed.

B. Proposed mix designs and all necessary substantiating data used to establish the proposed mix designs if ACI 301-05 Section 4.2.3.1 is followed.

C. Mix designs shall be submitted for all mixes proposed or required to be used, including all mixes containing admixtures.

D. A certified copy of the control records of the proposed production facility establishing the standard deviation as defined in Paragraph 4.2.3.2. of ACI 301.

E. Submit shop drawings as specified in ACI 301. Submit shop drawing showing the location of proposed construction and control joints separate from the steel reinforcement shop drawings.

1. Construction Joints
2. Control Joints
3. Steel Reinforcement

1.4 QUALITY ASSURANCE

The Contractor shall obtain and have available in the field office at all times, the following references:

A. ACI 301 Specifications for Structural Concrete for Buildings ACI 301 (latest Revision).

B. SP-15 (05) Field Reference Manual: Specifications for Structural Concrete for Buildings with selected ACI references.

Available from:

The American Concrete Institute
Publications Department
P.O. Box 9094
Farmington Hills, Michigan 48333-9094

C. Manual of Standard Practice - CRSI. (Latest Edition).

D. Placing Reinforcing Bars - CRSI (Latest Edition).

Available from:

Concrete Reinforcing Steel Institute
933 North Plum Grove Road
Schaumburg, Illinois 60173-4758

E. ACI 318-08 Building Code Requirements for Structural Concrete and Commentary.

F. ACI 347 Guide to Form Work for Concrete.

PART 2 - PRODUCTS

2.1 CLASSES OF CONCRETE AND USAGE

A. Structural concrete of the various classes required shall be proportioned by either Method 1 or Method 2 of ACI 301 to produce the following 28-day compressive strengths:

1. Selection of Proportions for Class A Concrete:

   a. 4,500 psi compressive for strength at 28 days.
   b. Type II cement plus supplementary cementitious materials.
   c. Max. water-cementitious materials ratio = 0.45.
   d. Min. cement content = 584 lbs.
   e. Nominal max. size coarse aggregate = No. 67 (3/4" max.) or No. 57 (1" max.). Walls with architectural treatment shall use No. 67 (3/4" max.).
   f. Air content = 6% plus or minus 1% by volume.
   g. Slump = 3" - 4" when tested in accordance with ASTM C 143/C 143M. Slump shall not exceed 8 inches when high-range water-reducers are used.

2. Selection of Proportions for Class B Concrete:

   a. 3,000 psi compressive strength at 28 days.
   b. Type I cement plus supplementary cementitious materials.
   c. Max. water-cementitious materials ratio = 0.45.
   d. Min. cement content = 470 lbs. (5.0 bags)/cu. yd. concrete.
   e. Nominal max. size coarse aggregate = No. 67 (3/4" max.) or No. 57 (1" max). Walls with architectural treatment shall use No. 67 (3/4" max.).
   f. Air content = 6% plus or minus 1% by volume.

g. Slump = 3" - 4" when tested in accordance with ASTM C 143/C 143M. Slump shall not exceed 8 inches when high-range water-reducers are used.

B. Concrete shall be used as follows:

1. Class A concrete for all concrete work except as noted below.
2. Class B concrete for fill concrete, thrust blocks and topping over hollow-core slabs, and where indicated on the Drawings.

C. Type II cement conforming to ASTM C 150 shall be used in all structural concrete. Cement for exposed to view concrete shall have a uniform color classification.

D. Coarse aggregate for concrete shall be size No. 57, as specified in ASTM C 33 unless a smaller size aggregate is required to conform to provisions of Section 4.2.2.3 of ACI 301. Coarse aggregate shall conform to all requirements of ASTM C 33.

E. Manufactured sand shall not be used as fine aggregate in concrete.

2.2 ADMIXTURES

A. An air entraining admixture shall be used on all concrete exposed to freezing and thawing cycles. Product shall be MB-AE 90, MB-VR or Micro Air by BASF Construction Chemicals or approved equal. A certification attesting to the percent of effective solids and compliance of the material with ASTM C 260 shall be furnished if requested.

B. Water-Reducing Admixture shall conform to ASTM C 494/C 494M Type A. Product shall be "Pozzolith" Series or "PolyHeed" Series by BASF Construction Chemicals or approved equal.

C. High-Range Water-Reducing Admixture shall conform to ASTM C 494/C 494M Type F. Product shall be Rheobuild 1000, "Glenium" Series or PS 1466 by BASF Construction Chemicals or approved equal.

D. Accelerating Admixture shall conform to ASTM C 494/C 494M Type C or E. Products shall be Pozzolith NC 534 or Pozzutec 20+ by BASF Construction Chemicals or approved equal.

E. Retarding Admixture shall conform to ASTM C 494/C 494M Type B or D. Product shall be "Pozzolith" Series or "DELVO" Series by BASF Construction Chemicals.

F. A water-reducing, set controlling admixture (nonlignin type) shall be used in all concrete. The admixture shall be a combination of polyhydroxylated polymers including catalysts and components to produce the required setting time based on job site conditions, specified early strength development, finishing characteristics required, and surface texture, as determined by the Engineer.

G. Certification shall be furnished attesting that the admixture exceeds the physical requirements of ASTM C 494, Type A, water-reducing and normal setting admixture, and when required, for ASTM C 494, Type D, water-reducing and retarding admixture when used with local materials with which the subject concrete is composed.

H. The admixture manufacturer, when requested, shall provide a qualified concrete technician employed by the manufacturer to assist in proportioning concrete for optimum use. He shall also be available when requested to advise on proper addition of the admixture to the concrete and on adjustment of the concrete mix proportions to meet changing job conditions.

I. The use of admixtures to retard setting of the concrete during hot weather, to accelerate setting during cold weather, and to reduce water content without impairing workability will be permitted if the following conditions are met:

J. The admixture shall conform to ASTM C494, except that the durability factor for concrete containing the admixture shall be at least 100 percent of control, the water content a maximum of 90 percent of control and length change shall not be greater than control, as defined in ASTM C 494.

K. Where the Contractor finds it impractical to employ fully the recommended procedures for hot weather concreting, the Engineer may at his discretion, require the use of a set retarding admixture for mass concrete 2.5 feet or more thick for all concrete whenever the temperature at the time concrete is cast exceeds 80oF. The admixture shall be selected by the Contractor subject to the review of the Engineer. The admixture and concrete containing the admixture shall meet all the requirements of these Specifications. Preliminary tests of this concrete shall be required at the Contractor's expense.

L. When more than one (1) admixture is used, all admixtures shall be compatible. They should preferably be by the same manufacturer.

M. Calcium chloride will not be permitted as an admixture in any concrete.

2.3 REINFORCEMENT

A. The minimum yield strength of the reinforcement shall be 60,000 pounds per square inch. Bar reinforcement shall conform to the requirements of ASTM A 615/A 615M. All bar reinforcement shall be deformed.

B. Wire-mesh reinforcement shall be continuous between expansion joints. Laps shall be at least one full mesh plus 2 inches, staggered to avoid continuous lap in either direction and securely wired or clipped with standard clips.

C. Smooth dowels shall be plain steel bars conforming to ASTM A 615/A615M, Grade 60, or steel pipe conforming to ASTM A 120, Schedule 80. Pipe, if used, shall be closed flush at each end with mortar or metal or plastic cap. Dowels shall be installed at right angles to construction joints and expansion joints. Dowels shall be accurately aligned parallel to the finished surface and shall be rigidly held in place and supported during placing of the concrete. One end of dowels shall be oiled or greased, or dowels shall be coated with high-density polyethylene with a minimum thickness of 14 mils.

D. Reinforcement supports and other accessories in contact with the forms for members which will be exposed to view in the finished work shall be of stainless steel or shall have approved high-density polyethylene tips so that the metal portion shall be at least 1/4 of an inch from the form or surface. Supports for reinforcement, when in contact with the ground or stone fill, shall be precast stone concrete blocks. Particular attention is directed to the requirement of Paragraph

3.3.2.4 of ACI Standard 301. These requirements apply to all reinforcement, whether in walls or other vertical elements, inclined elements or flatwork.

E. Particular care shall be taken to bend tie wire ends away from exposed faces of beams, slabs and columns. In no case shall ends of tie wires project toward or touch formwork.

2.4 OTHER MATERIALS

A. Anchorage items shall be of standard manufacture and of the type required to engage with the anchors to be installed therein under other sections of the Specifications and shall be subject to approval by the Engineer.

1. Slots shall be galvanized dovetail-type as specified in Section "Masonry Work".
2. Inserts shall be malleable iron or steel, and of sturdy design adequate strength for the load to be carried. All inserts shall be galvanized. Adjustable wedge inserts shall have an integral loop or strap at the back or shall be slotted to receive a special-headed bolt not smaller than 5/8-inch in diameter and of the required length and fitted with a hexagonal nut. Other inserts shall be either threaded or slotted as required by their usage. Threaded inserts shall have integral lugs to prevent running.
3. Concrete anchors shall be an approved expansion type conforming to Federal Specification FF-S-325, Groups I, II, III, or VIII, and shall be installed in strict accordance with the manufacturer's recommendations. Material for anchors shall be as specified in Section 05500 "Miscellaneous Metals". Anchors shall develop ultimate shear and pull-out loads of not less than the following values in Class A concrete:

Bolt Diameter (Inches)	Min. Shear (Pounds)	Min. Pull-Out Load (Pounds)
2	4,500	4,600
5/8	6,900	7,700
3/4	10,500	9,900

B. Epoxy bonding adhesive used to bond fresh plastic concrete to sound, hardened concrete shall meet the following Specification. The contractor shall furnish a notarized certification by the manufacturer that the proposed material meets the Specification.

1. Material:

The epoxy material shall consist of a 2-component system whose components conform to the following requirements:

a. Component A - Component A shall be a modified epoxy resin of the epichlorohydrin bisphenol A condensation type, containing suitable viscosity control agents and having an epoxide equivalent of 180-200.
b. Component B - The B component shall be primarily a reaction product of one mole of an aliphatic polyamine and two moles of mono-functional epoxide containing compounds modified with 2, 4, 6 tri (dimethylaminomethyl) phenol.
c. The component ratio of B to A by volume shall be as specified by the manufacturer.

2. Properties of Mixed Components:

a.	Solids Content	100% by weight
b.	Pot Life	25-35 min. @ 73°F.
c.	Tack-Free Time	4-5-1/2 hrs @ (Thin Film) 73°F.
d.	Final Cure ASTM D 695	3 days at 73°F. (75% ultimate strength)
e.	Initial Viscosity (A+B)	2,000 cps. min at 73°F.
f.	Color Mixed	Straw

3. Properties of Cured Material (Neat Material):

a.	Tensile Strength ASTM D 638	3,000 psi min. @ 14 days 73°F. cure
b.	Tensile Elongation ASTM D 638	2 - 2% at 14 modified days 73°F. cure
c.	Compressive Strength ASTM D 695	12,500 psi min. at 73° F. cure
d.	Compressive Modules ASTM D 695	470,000 psi min. @ 28 days, 73°F cure
e.	Compressive Strength ASTM D 695	5,500 psi min. @ 24 days 73°F cure
f.	Water Pick-up ASTM D 570	1.5 max.

C. Premolded expansion-joint filler strips shall conform to ASTM D 1752 and shall be 3/8-inch thick unless otherwise shown.

D. Joint sealants shall conform to ANSI A 116.1. The following joint sealants are acceptable:

1. Colma by Sika Chemical Corporation
2. Hornflex by A.C. Horn, Inc.
3. Sonolastic by BASF Construction Chemicals.

E. Nonshrink grout shall be Embeco 885 grout by BASF Construction Chemicals, Euco Firmix grout by the Euclid Chemical Company, or approved equal. The approved product shall be delivered to the site of the Work in the original sealed containers, each bearing the trade name of the material and the name of the manufacturer.

F. Hardeners and dustproofers shall be colorless, aqueous solution of zinc or magnesium fluosilicate. Each gallon of solution used for the first application shall contain not less than one pound of crystals. Each gallon of solution used for subsequent application shall contain not less than two pounds of crystals. Materials shall be reviewed by the Engineer. Product shall be Lapidolith by BASF Construction Chemicals or approved equal.

G. Porous fill shall be crushed rock or gravel of such size that all will pass a 1-1/2 inch screen and not more than 5 percent will pass a No. 4 screen, free from earth clay or other foreign substances.

H. Waterstops: Waterstops shall be polyvinyl chloride, flat dumbbell shape (no center bulb), of size shown on Drawings, complete with fittings as required such as unions, vertical tees, vertical ells, flat crosses, flat ells, flat tees, etc. Waterstops shall be securely wired into place to

maintain proper position during placement of fresh concrete, as shown on the Drawings. Care shall be taken in the installation of the waterstop and the placing of the concrete to avoid "folding" while concrete is being placed, and to prevent voids in the concrete surrounding the waterstop.

I. Form Liners: Form liners for construction of fluted wall treatment shall be prefabricated plastic liners as manufactured by Greenstreak Plastic Products, Interform Company, or Symons Corporation.

1. Liners shall be fiberglass or ABS (acrylonitrile - butadiene - styrene) of such configuration as to obtain the fluted pattern shown or indicated on the Drawings.
2. For purposes of designating type and quality of material required, form liners shall be pattern 361 trapezoidal liners as manufactured by Greenstreak Plastic Products.
3. Preparation of forming materials, sealing of joints to prevent grout leakage and form release treatment (if required) shall be in strict compliance with the manufacturer's printed instructions and recommendations.

PART 3 - EXECUTION

3.1 FINISHES

A. Exposed to Public View Concrete Surfaces:

1. All concrete exposed to view in the completed structure shall be produced using materials and workmanship to such a quality that only nominal finishing will be required. The provisions of paragraphs 6.2.2.1 and 6.3.6 of ACI 301 shall apply to all exterior exposed to public view concrete surfaces, including the outside surfaces of tanks.
2. Forms for exposed concrete surfaces shall be exterior grade, high-density overlay plywood, steel, or wood forms with smooth tempered hard-board form-liners.
3. Forms shall be coated with an approved release agent before initial pour and between subsequent pours, in accordance with the manufacturer's printed instructions. Form boards shall not be wet prior to placing concrete.
4. Recessed joints in concrete shall be formed using lacquer-coated wood battens or forms, milled to indicated profiles. Battens and corner strips shall be carefully inspected before concrete is placed and damaged pieces replaced.
5. Chamfer strips shall be one (1) inch radius with leg, polyvinyl chloride strips by Gateway Building Products, Saf-T-Grip Specialties Corp., Vinylex Corp., or equal.
6. Form panels shall be provided in the maximum size practicable in order to minimize form joints. Wherever practicable, form joints shall occur at recessed joints. All form joints in exterior exposed to view surfaces shall be carefully caulked with an approved nonstaining caulking compound. Joints shall not be taped. Form oil or other material which will impart a stain to the concrete shall not be allowed to contact concrete surfaces.
7. Care shall be taken to prevent chipping of corners or other damage to concrete when forms are removed. Exposed corners and other surfaces which may be damaged by ensuing operations shall be protected from damage by boxing, corner boards or other approved means until construction is completed.
8. Form ties shall remain in the walls and shall be equipped with a water seal to prevent passage of water through the walls. The minimum set back of form ties shall be 1-1/2 inches from faces of wall. The hole left by removal of tie ends shall be sealed and

grouted in accordance with the procedure described hereinafter in Par. 3.01.F. Form ties will be permitted to fall within as-cast areas of architecturally treated wall surfaces; this does not apply to walls receiving decorative waterproof masonry coating.

9. All formed exposed to view concrete surfaces shall have a "smooth rubbed finish". Exterior vertical surfaces shall be rubbed to one foot below grade. Interior exposed to public view vertical surfaces of liquid containers shall be rubbed to one (1) foot below the minimum liquid level that will occur during normal operations.

B. All vertical surfaces in liquid-containing structures shall have a "smooth form" finish.

1. All "smooth form" concrete vertical surfaces shall be a true plane within 1/4 inch in 10 feet as determined by a 10-foot straightedge placed anywhere on the surface in any direction. Abrupt irregularities shall not exceed 1/8 inch.

C. Basin, flume, conduit and tank floors shall have a "troweled" finish unless shown otherwise on Drawings.

D. Weirs and overflow surfaces shall be given a "troweled" finish.

E. Exterior platforms, steps and landings, shall be given a "broom" finish. "Broom" finish shall be applied to surfaces which have been steel-troweled to an even, smooth finish. The troweled surface shall then be broomed with a fiber-bristle brush in the direction transverse to that of the main traffic.

F. Patching of holes due to removal of tie ends and other repairable defective areas, shall be as follows: Entire contact area of hole shall be coated with two-part moisture insensitive epoxy bonding compound as specified in Par. 2.04.B. in accordance with manufacturer's specifications, and prior to placing of freshly mixed patching mortar. Parching mortar shall be mixed and placed in general accordance with ACI 301, Par. 5.3.7.5.

G. For floors and slabs in which drains occur, special care shall be exercised to slope the floors uniformly to the drains. All floors with drains shall be sloped not less than 1/8 inch per foot unless otherwise shown. In all areas where quarry tile or other materials requiring more than 1/4 inch drop are to be overlaid, the concrete base slab shall be depressed to provide a finished floor at the same elevation as surrounding areas.

3.2 TESTING

A. All testing shall be in accordance with provisions of ACI 301. Testing services listed in ACI Sections 1.6.4 shall be performed by a testing agency acceptable to the Engineer and Owner.

B. The testing services of ACI sections 1.6.4.2 and 1.6.4.3 shall be performed at the Contractor's expense. The Owner-approved third-party testing agency shall be responsible for making concrete test cylinders, storing and protecting concrete cylinders, and delivering cylinders to the Owner-approved testing laboratory.

C. Testing services of ACI Section 1.6.4.4 shall be paid for by the Contractor. Test shall be made for each 50 cubic yards of concrete and/or each day concrete is placed.

3.3 ADDITIONAL REQUIREMENTS

A. Unless otherwise directed by the Engineer, the vertical surfaces of footings shall be formed. Excavations and reinforcement for all footings shall have been inspected by the Engineer before any concrete is placed.

B. The installation of underground and embedded items shall be inspected before slabs are placed. Pipes and conduits shall be installed below the concrete unless otherwise indicated. The fill required to raise the subgrade shall be placed as specified in Section 312000 "Earthwork". Porous fill not less than 6 inches in compacted thickness shall be installed under all slabs, tank bottoms, and foundations. The fill shall be leveled and uniformly compacted to a reasonably true and even surface. The surfaces shall be clean, free from frost, ice, mud and water. Waterproof paper, polyethylene sheeting of nominal 4-mil minimum thickness, or polyethylene-coated burlap shall be laid over all surfaces receiving concrete.

C. Concrete shall be placed in layers not over 18 inches deep and each layer shall be compacted by mechanical internal-vibrating equipment supplemented by hand spading, rodding and tamping as directed. Vibrators shall not be inserted into lower courses that have begun to set.

D. Concrete Mixing

1. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M and furnish batch ticket information.

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

2. Project site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

    a. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at lease 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
    b. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd.
    c. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

E. If concrete is placed by pumping, no aluminum shall be used in any parts of the pumping system which contact or might contaminate the concrete. Aluminum chutes and conveyors shall not be used.

F. All concrete surfaces shall be moist cured by the application of absorptive mats or double thicknesses of fabric kept continuously wet. Forms shall be kept continuously wet. Use of other curing methods will not be permitted unless written authorization is received from the Engineer.

G. The unit of operation shall not exceed 30 feet for tank walls and walls exposed to weather, and 45 feet for other work in any horizontal direction and not less than 48 hours shall elapse between casting of adjoining units unless these requirements are waived by the Engineer. Provision shall be made for jointing successive units as indicated or required to be made at spacing of approximately 25 feet. Additional construction joints required to satisfy the 25-foot spacing shall be located by the Contractor subject to the review of the Engineer. The Contractor shall submit for review drawings separate from the steel reinforcing drawings, showing the location of all proposed construction joints. All construction joints shall be prepared for bonding by roughening the surface of the concrete in an acceptable manner which will expose the aggregate uniformly and will not leave laitance, loosened particles of aggregate or damaged concrete at the surface. Joints in walls and columns shall be maintained level. Concrete shall be placed in layers not over 18 inches deep and each layer shall be compacted by mechanical internal-vibrating equipment supplemented by hand spading, rodding and tamping as directed. Vibrators shall not be inserted into lower courses that have begun to set.

H. Formwork for beam soffits and slabs and other parts that support the weight of concrete, shall remain in place until the concrete has reached its specified 28-day strength, unless otherwise specified or permitted.

I. Concrete Walks and Curbs:

1. Subgrade shall be true and well compacted at the required grades. Spongy and otherwise unsuitable material shall have been removed and replaced with approved material. Concrete walks shall be placed upon porous fill covered with waterproof paper, polyethylene sheeting of nominal 4-mil minimum thickness or polyethylene-coated burlap.
2. Concrete walks shall be not less than 4 inches in thickness. Walks shall have contraction joints every 5 linear feet in each groove in the top surface of the slab to a depth of at least one-fourth the slab thickness with a jointing tool. Transverse expansion joints shall be installed at all returns, driveways, and opposite expansion joints in adjacent curbs. Where curbs are not adjacent, transverse expansion joints shall be installed at intervals of approximately forty (40) feet. Sidewalks shall receive a "broomed" finish. Scoring shall be in a transverse direction. Edges of the sidewalks and joints shall be edged with a tool having a radius not greater than 1/6 inch. Sidewalks adjacent to curbs shall have a slope of 1/4 inch per foot toward the curb. Sidewalks not adjacent to curbs shall have a slope of 1/4 inch per foot. The surface of the concrete shall show no variation in cross section in excess of 1/4 inch in 5 feet. Concrete walks shall be reinforced with 6 x 6-W1.4xW1.4 welded wire reinforcement.
3. Concrete curbs shall be constructed to the section indicated on the Standard Detail, and all horizontal and vertical curves shall be incorporated as indicated or required. Forms shall be steel as approved by the Engineer. At the option of the Contractor, the curbs may be precast or cast-in-place. Cast-in-place curbs shall be divided into sections 8 to 10 feet in length using steel divider plates. The divider plates shall extend completely through the concrete and shall be removed. Precast curbs shall be cast in lengths of 4 to 5 feet. All exposed surfaces of concrete shall be finished smooth. All sharp edges and the edges of joints and divisions shall be tooled to 1/4 inch radius. Steel reinforcement shall be installed where the curb crosses pipe trenches or other insecure foundations. Such reinforcement shall consist of two (2) No. 4 deformed bars near the bottom of the curb and shall extend at least 24 inches beyond the insecure area. Transverse expansion joints shall be installed at all curb returns and at intervals of approximately 40 feet.

J. Column base plates, bearing plates for beams and similar structural members, machinery and equipment bases shall, after being plumbed and properly positioned, be provided with full bearing with nonshrink grout. Concrete surfaces shall be rough, clean, free of oil, grease, and laitance and shall be moistened thoroughly immediately before grout is placed. Metal surfaces shall be clean and free of oil, grease and rust. Mixing and placing shall be in conformance with the material manufacturer's printed instructions. After the grout has set, exposed surfaces shall be cut back one (1) inch and covered with a parge coat of mortar consisting of one (1) part Portland cement, two (2) parts sand and sufficient water to make the mixture placeable. Parge coat shall have a smooth dense finish. Exposed surfaces of grout and parge coat shall be water cured with wet burlap for seven (7) days.

K. Grout fill which is formed in place by using rotating equipment as a screen, such as clarifiers and similar types of equipment, shall be mixed in proportions and consistencies as required by the manufacturer or supplier of the equipment.

L. Watertightness:

1. The structures which are intended to contain liquids and/or will be subjected to exterior hydrostatic pressures shall be so constructed that, when completed and tested, there shall be no loss of water, and no wet spots shall show.
2. As soon as practicable, after the completion of the structures, the Contractor shall fill them with water and if leakages develop or wet spots show, the Contractor shall empty such structures and correct the leakage in an approved manner. Any cracks which appear in the concrete shall be dug out and suitably repaired. Temporary bulkheads over pipe openings in walls shall be provided as required for the testing.
3. After repairs, if any are required, the structures shall be tested again and further repaired, if necessary, until satisfactory results are obtained. All work in connection with these tests and repairs shall be at the expense of the Contractor.
4. Waterstops shall be placed in other locations as indicated on the Drawings and as may be required to assure the watertightness of all containers of liquids. Special shop-fabricated ells, tees, and crosses shall be provided at junctions. Waterstops shall be extended at least 6 inches beyond end of placement in order to provide splice length for subsequent placement. In slabs and tank bottoms, water stops shall be turned up to be made continuous with waterstops at bottom of walls or in walls.
5. Joints between pipe (except cast iron wall pipe) and cast-in-place concrete walls shall be sealed by means of a groove cast completely around the pipe; the groove shall be filled with a quick setting hydraulic compound similar and equal to "Master Seal 590" as made by BASF Construction Chemicals mixed and applied by the manufacturer's instructions.

M. Unless otherwise shown or directed, all pumps, other equipment, and items such as lockers, motor control centers and the like, shall be installed on concrete bases. The bases shall be constructed to the dimensions shown on the plans or as required to meet plan elevations. Where no specific plan elevations are required, the bases shall be 6 inches thick and shall extend 3 inches outside the metal equipment base. In general, the concrete bases shall be placed up to 2 inches below the metal base. The equipment shall then be properly shimmied to grade and the 2- inch void filled with nonshrink grout.

N. Concrete which, in the opinion of the Architect-Engineer, has excessive honeycomb, aggregate pockets or depressions will be rejected and the Contractor shall, at his own expense, remove the entire section containing such defects and replace it with acceptable concrete.

O. Manhole or access steps shall be plastic, constructed of copolymer polypropylene meeting the requirements of ASTM D 2146 for Type II, Grade 16906 material. Step shall be reinforced with ASTM A 615, Grade 60, #4 deformed steel reinforcing bar, be 9 inches deep, 14 inches wide, provided with notched tread ridge, foot retainer lugs on each side of tread and penetration stops for press fit installation. Plastic steps shall be PS2-PF as manufactured by M.A. industries, Inc., Peachtree City, Georgia. Steps shall be installed by drilling 1 inch diameter holes, minimum 3-3/4 inches deep into the wall, and then driving steps into hole to the penetration stop, resulting in a press fit condition.

P. Tank pressure relief valves shall be 6 inches diameter Neenah Foundry Company R-5001-1, American Valve & Hydrant B315.1, or equal, floor type, with outside hooks or inside self-contained lock; quantity and spacing as shown on structural drawings. No part of pressure relief valves shall project above the neat line of the tank floor to prevent fouling of scraper mechanisms where used.

Q. All existing contact surfaces with new patch shall be coated with moisture-insensitive epoxy bonding adhesive, Sikadur Hi-Mod, Concresive LPL Liquid by BASF Construction Chemicals, or approved equal. Patch shall consist of base pour of 4,000 psi structural concrete, then a topping of non-shrink natural aggregate grout, Masterflow 713, Sonogrout by BASF Construction Chemicals, or approved equal, mixed and placed in accordance with manufacturer's instructions, to the thicknesses shown on Drawings. Coat base pour with epoxy bonding adhesive prior to placing grout course.

END OF SECTION 033000

SECTION 034000 – PRECAST CONCRETE STRUCTURES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment and services required to furnish and install all precast concrete structures and accessories appurtenances as shown on the Drawings and specified herein.

B. Delegated Design: Design precast concrete structures, including comprehensive engineering analysis by a qualified Professional Engineer, licensed in the state in which the project using performance requirements and design criteria indicated.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Cast-in-Place Concrete: Section 033100

B. Access Hatches: Section 107445

1.3 SUBMITTALS

The Contractor shall submit the following data for Engineer's review in accordance with Section 013323.

A. Delegated Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data, calculations, and erection drawings signed and sealed by the qualified Professional Engineer responsible for their preparation.

B. Product Data: For each type of product indicated included but not limited to standard precast units, proprietary precast units, embedded items, and accessories.

C. Design Data: Submit calculations prepared under the direct supervision of a Professional Engineer supporting the structural design, including resistance to buoyancy with groundwater table to the top of the structure, resistance to uplift and resistance to wheel loads in accordance with requirements and references indicated. The calculations shall be sealed by a Professional Engineer licensed in the state in which the project is located.

D. Test Reports: Submit test reports for the following:

1. Material certifications and/or laboratory test reports, including mill tests and all other test data, for Portland cement, blended cement, pozzolans, ground granulated blast furnace slag, silica fume, aggregate, admixtures, and curing compound proposed for use on this Project.
2. Test reports showing that the mix has been successfully tested to produce concrete with the properties specified and will be suitable for the job conditions. Such tests may include compressive strength, flexural strength, plastic or hardened air content, freeze thaw

durability, abrasion and absorption. Clearly detail in the specifications special tests for precast concrete or cast-in items.

3. Sufficient documentation, when the use of self-consolidating concrete (SCC) is proposed, showing a minimum of 30-days production track records demonstrating that SCC is appropriate for casting of the product.
4. In-plant QA/QC inspection reports, upon the request of the Project Representative.

E. Shop Drawings: Submit shop drawings for standard precast units and custom-made precast units prepared under direct supervision of a Professional Engineer licensed in the state in which the project is located. Shop drawings shall include:

1. The criteria and loads used in the design of the precast components.
2. All materials used, their specifications and their design strengths.
3. Layout, piece mark, dimensions, reinforcing, and connection details of each precast member, including openings.
4. Details and instructions for lifting, rigging, erection, and installation of each precast component.
5. Lists and descriptions of all loose accessory materials supplied.
6. Instructions on secondary pours (in the field) when required.
7. Professional Engineer's seal.

F. Quality Control Procedures: Submit certificate from the NPCA QC Manual that the precast concrete structure manufacturer participates in their QA/QC program.

G. Manufacturer's Instructions.

1.4 QUALITY ASSURANCE

A. Manufacturer of precast concrete structures shall be quality certified by NCPA. Inspect manufacture of structures in accordance with ASTM C1037.

B. Installer of precast concrete structures shall have a record of at least three years of successful installation of similar products on similar projects.

C. Inspection of earthwork, compaction and backfill shall be in accordance with the earthwork specifications in Division 31.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver precast units to the site in accordance with the delivery schedule to avoid excessive build-up of units in storage at the site. Upon delivery to the jobsite, all precast concrete units will be inspected by the Project Representative for quality and final acceptance.

B. Store units off the ground or in a manner that will minimize potential damage.

C. Handle, transport, and store products in a manner to minimize damage. Lifting devices or holes shall be consistent with industry standards. Perform lifting with methods or devices intended for this purpose as indicated on Shop Drawings.

PART 2 - PRODUCTS

2.1 PRECAST CONCRETE STRUCTURES

A. Circular precast vaults and structures shall conform to ASTM C478. Non-circular vaults and structures shall conform to ASTM C857. Access hatch and pipe penetrations shall be cast in the top slab and/or sides as indicated on the drawings.

B. Manhole frames and covers shall have a clear opening of 22 inches and shall be made of cast iron conforming to ASTM A48/A48M Class 30. Casting shall be smooth, clean and free from blisters, blowholes and shrinkage. Castings shall be dipped twice in a preparation of asphalt or coal tar and oil applied at a temperature of not less than 144 degrees F and not more than 155 degrees F so as to form a tenacious coating.

C. Structural design of precast concrete structures is hereby delegated.

D. All precast concrete structures shall be designed to resist the lateral soil pressures and fluid pressures in accordance with ASTM C857.

E. All precast concrete structures have integral flanges at the base to engage enough soil resistance to resist the buoyant force from full submergence.

F. All precast concrete structures shall be designed to support HL-93 or HS25-44 wheel loads in accordance with the AASTHO HB-17 anywhere on the top surface of the structure.

G. Joints: Joints shall be watertight and shall be sealed with one of the following:

1. Rubber gaskets conforming to ASTM C443.
2. Pre-formed flexible butyl type joint sealant conforming to AASHTO M198.

    a. Hamilton Kent "Kent Seal No. 2"
    b. K.T. Snyder Company "Rub'r Nek"
    c. Press Seal Gasket "E Z Stik"
    d. Concrete Sealants, Inc. "ConSeal"

H. Corrosion Control: Follow recommendations outlined in ACPA 01-110 when hydrogen sulfide is indicated as a potential problem.

I. External Rubber Wrap:

1. Each precast concrete structure joint shall be sealed with an external rubber wrap as manufactured by Sealing Systems, Inc., or equal. The wrap shall be made of a Stretchable, Self-Shrinking, IntraCuring Halogenated Based Rubber with a minimum thickness of 30 mils. The back side of each unit shall be coated with a cross-linked re-enforced butyl adhesive. The butyl adhesive shall be non-hardening sealant, with a minimum thickness of 30 mils. The wrap shall be designed to stretch around the substrate then overlapped creating a cross-link and fused bond between the rubber and butyl adhesive. The application shall form a continuous rubber seal that applies inward pressure on the protected area for the life of the application. The butyl adhesive and the

inward pressure exerted on the substrate will prevent the intrusion of water and soil through the joint sections of a manhole.

External Rubber Wrap Specifications

Height	9 inches
Length	16 or 50 foot rolls
Thickness	60 mils
Height tolerances	9 inches +/- .188"
Length tolerances	+/- 3"
Rubber Thickness tolerances	30 mils
Butyl Adhesive Thickness	30 mils

Stretchable, Self-Shrinking, Intra-Curing Halogenated Based Rubber

Physical Properties	ASTM Test Method	Typical Value
Sheer Strength	D816	20 lb. PSI min
Tensile, PSI	D412	50 PSI
Elongation %	D412	500%
Penetration	D217	60/140 MM
Low Temperature	D746	Minus 49º F flexibility
Heat Aging	D573 7 days @ 90 degrees C	
Tensile Strength	minimum, PSI (MPa) > 100 PSI	Pass
Fusion	5/64" (0.2) max	Pass
Elongation %	minimum 300% at break	Pass
Ozone Resistance	no visible signs of cracking	Pass
Aging and Storage	300% elongation applied (10 Years)	Pass
UV Resistance	No visible signs of cracking	Pass

PART 3 - EXECUTION

3.1 FABRICATION

A. Fabricate precast concrete structures in accordance with NPCA QC Manual.

3.2 INSTALLATION

A. Install precast concrete structures in accordance with ASTM C891 and the manufacturer's instructions.

B. Lift precast components at designated lifting points in accordance with the manufacturer's instructions and other applicable safety standards.

C. Precast concrete structures shall bear on a minimum 4-inches-thick bedding / base / drainage course of free-draining granular material. See Division 31 for bedding / base / drainage course materials.

D. Do not bear precast concrete structures on uneven subgrade or grade with high points from rock pinnacles or boulders or rock ledges.

E. Install precast concrete structures in proper location, with the proper alignment and level.

F. Backfill around the precast concrete structures in accordance with Division 31 specifications.

3.3 JOINTS

A. Joints shall be sealed with an approved sealant as specified in Part 2 and shall be mortared or grouted.

B. When making joints with mastic compound prime and seal all joints with primer supplied with the joint compound.

C. Joints shall be watertight.

D. Pipe Connections into Precast Structures:

1. Precast Openings:

a. Pipe shall be sealed in the precast section pipe opening with a resilient connector meeting the requirements of ASTM C923. Resilient connector shall be "Dura-Seal III" by Dura-Tech, Dayton, Ohio; "A-Lok" by A-LOK Products, Inc.; or approved equal.
b. Resilient connector shall be cast integrally into the wall of the precast section at the time of manufacture. There shall be no mortar placed around the connector on the outside of the manhole and no mortar shall be placed around the top half of the connector on the inside of the manhole when completing the invert work.
c. Resilient connectors requiring compression clamps or take up clamps will not be approved.

2. Cored Openings:

a. Pipe shall be sealed in cored precast section pipe opening with a resilient mechanical connector meeting the requirements of ASTM C923. Resilient connector shall be "NPC Kor-N-Seal I" (with stainless steel wedge) by Trelleborg Pipe Seals Milford, Inc.; "PSX: Direct Drive" by Press-Seal Gasket Corporations; interlocking link pipe seal; or approved equal. All fasteners and hardware shall be Type 304 stainless steel.
b. There shall be no mortar placed around the connector on the outside of the structure and no mortar shall be placed around the top half of the connector on the inside of the structure when completing the invert work.

3.4 LEAKAGE TESTING

A. Leakage tests shall be made and observed by the Project Representative's representative for all precast structures. The test shall be the watertightness (exfiltration) test as described herein.

B. After each structure has been assembled in place, including wall piping, all lifting holds shall be filled with an approved non-shrink, non-metallic grout. Upon completion, each precast structure shall be tested to determine watertightness. The leakage test shall be made prior to placing any fill material and prior to application of interior/exterior wall coatings if specified. If the groundwater table has been allowed to rise above the bottom of the structure, it shall be lowered for the duration of the test. All pipes and other openings into the structures shall be suitably plugged and the plugs braced to prevent blow out.

C. The tank shall be filled with potable water to the maximum level. The test shall consist of measuring the liquid level over the next 24 hours to determine if any change has occurred. If a change is observed and exceeds the maximum allowance, the test shall be extended to a total of five days. If at the end of five days the average daily change has not exceeded the maximum allowance, the test shall be considered satisfactory.

D. The liquid volume loss for a period of 24 hours shall not exceed one-twentieth of one percent of the tank capacity, 0.0005 x tank volume. If the liquid volume loss exceeds this amount, it shall be considered excessive, and the tank shall be repaired and retested.

E. Damp spots will not be permitted at any location on the structure wall. Damp spots are defined as spots where moisture can be picked up on a dry hand. All such areas shall be repaired as necessary.

F. Damp spots or standing water on the footing may occur upon tank filling and are permissible within the allowable volume loss. Measurable flow in this area is not permissible and must be corrected.

G. It shall be the Contractor's responsibility to uncover the structure as necessary and to disassemble, reconstruct, or replace it as directed by the Project Representative. The structure shall then be retested.

H. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorptions, etc. It will be assumed that all loss of water during the test is a result of leaks through the joints or through the concrete. Furthermore, the Contractor shall take any steps necessary to assure the Project Representative that the water table is below the bottom of the structure throughout the test.

3.5 CLEAN UP

A. Upon completion of installation of the precast structures and appurtenances, the Contactor shall remove all debris and surplus construction materials resulting from the Work. The Contractor shall grade the ground around and adjacent to the construction area in a uniform and neat manner to the final grade lines.

END OF SECTION 034000

DIVISION 05

METALS

SECTION 055133 – ALUMINUM LADDERS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fixed aluminum wall ladders.

B. Fasteners and installation accessories.

1.2 RELATED SECTIONS

A. Rough Carpentry: Section 061000

B. Aluminum Grating: Section 055300

1.3 REFERENCES

A. ANSI A14.3 - American National Standard for Ladders -- Fixed -- Safety Requirements; 1992.

B. ASTM B 210 - Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes; 2002.

C. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2000.

D. ASTM B 308 - Standard Specification for Aluminum-Alloy T6061-T6 Standard Structural; 2002

E. OSHA 29 CFR Standard 1910.27 - Fixed ladders; Occupational Safety and Health Standards; current edition

1.4 SUBMITTALS

A. Submit under provisions of Section 013323.

B. Product Data: Manufacturer's data sheets on each product to be used, including:

1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings: Detailed drawings showing complete dimensions, all materials, mounting attachments, and fabrication details.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in the engineering and manufacturing of metal ladders, with not less than twenty years of experience.

1.6 WARRANTY

A. See Section 017700 - Closeout Submittals, for additional warranty requirements.

B. Provide manufacturer's standard limited five-year warranty against defects in materials and workmanship.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers: Subject to compliance with requirements, provide products of one of the following:

1. Alaco Ladder Co.
2. ACL Industries, Inc.
3. Jomy Products, Inc.
4. O'Keeffe's, Inc.

B. Requests for substitutions will be considered in accordance with provisions of Section 012500.

2.2 MATERIALS

A. Extruded Aluminum Profiles: ASTM B 221, ASTM B 210, ASTM B 308, Alloy 6061-T6; standard mill finish.

B. Aluminum Sheet and Plate: ASTM B 209, Alloy 6061-T6; standard mill finish.

C. Fasteners: Aluminum solid aircraft rivets rated at 300 lbs. shear strength.

D. Cast fittings, connectors and rung ends: Cast Aluminum alloy 356.

2.3 LADDERS

A. Ladders - General: Comply with ANSI A14.3 and OSHA regulations.

B. Fixed Wall Ladders: Extruded aluminum; serrated rungs 1-1/8 inches (29 mm) in diameter, connected to 2-7/8-inch (73 mm) side rail channels with cast aluminum rung connectors, each secured to rails by means of four solid aircraft rivets.

1. Capacity: 500 lbs. (225 kg).

2. 24 inches wide.

2.4 FINISHES

A. Provide all aluminum in standard mill finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved shop drawings, and in compliance with ANSI A14.3 and OSHA 1910.27.

3.3 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 055133

DIVISION 09

FINISHES

SECTION 099600 – HIGH PERFORMANCE PAINTS AND COATINGS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

A. Provide all labor, materials, equipment and services for furnishing and installing the finishes as indicated on drawings and schedules, and as herein specified.

B. Work includes painting and finishing of interior and exterior exposed items and surfaces throughout project, except as otherwise indicated. Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of work.

C. Work includes field painting of exposed bare and covered pipes and ducts (including color coding), and of hangers, exposed steel and iron work, and primed metal surfaces of equipment installed under mechanical and electrical work, except as otherwise indicated. In addition, the Contractor shall provide for the use of deep tone colors to be applied in selected areas as wall graphics, stripes and visual accents. The areas and colors shall be selected by the Architect-Engineer and shall not exceed 15 percent of the total wall surface area to be painted.

D. "Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

E. Surfaces to be Painted: Except where natural finish of material is specifically noted as a surface not to be painted, paint exposed surfaces whether or not colors are designated in "schedules". Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials or areas. If color or finish is not designated, Architect-Engineer will select these from standard colors or finishes available.

F. Following categories of work are not included as part of field- applied finish work.

1. Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer-finishing is specified for such items as (but not limited to) toilet enclosures, prefinished partition systems, acoustic materials, architectural woodwork and casework, and finish mechanical and electrical equipment, including light fixtures, switchgear, and distribution cabinets.
2. Concealed Surfaces: Unless otherwise indicated, painting is not required on surfaces such as walls or ceilings in concealed areas and generally inaccessible areas, furred areas, pipe spaces, and duct shafts.
3. Finished Metal Surfaces: Unless otherwise indicated, metal surfaces of anodized aluminum, stainless steel, chromium plate, copper, bronze and similar finished materials will not require finish painting.
4. Operating Parts: Unless otherwise indicated, moving parts of operating units, mechanical and electrical parts, such as valve and damper operators, linkages, sinkages, sensing devices, motor and fan shafts will not require finish painting.

G. Following categories of work are included under other sections of these specifications.

1. Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, metal fabrications, hollow metal work and similar items.
2. Unless otherwise specified, shop priming of fabricated components such as architectural woodwork, wood casework and shop-fabricated or factory-built mechanical and electrical equipment or accessories is included under other sections of these Specifications.

H. Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

I. PVC plastic process piping shall not be painted but shall be stenciled and labeled or tagged for identification surfaces. Each type of process piping using PVC pipe shall be installed using the same color pipe.

J. Repainting of existing structures, tanks, piping, and all other existing items shall not be part of this Contract unless otherwise noted. Areas that have been directly altered or damaged by construction shall be repainted to match existing conditions using the appropriate painting system.

1.2 RELATED DOCUMENTS

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

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical information including paint label analysis and application instructions for each material proposed for use.

B. Samples: Prior to beginning work, submit color chips for surfaces to be painted. Use representative colors when preparing samples for review. Submit samples for Architect-Engineer's review of color and texture only. Provide a listing of material and application for each coat of each finish sample.

C. Submit manufacturer's data and shop drawings for the materials specified herein. Comply with all requirements of Section 013323.

D. 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.

E. At the time of submission, the Contractor shall, in writing, call the Engineer's attention to any deviations that the submittals may have from the requirements of the Engineer's Contract Drawings and Specifications.

F. In accordance with the requirements of the General and Special Conditions and this Section, the following table includes, but is not limited to, the items required to be submitted:

Item Description	Shop Drawings	Product Data	Schedules	Installation Data	Parts Lists	Wiring Diagram	Samples	O & M Manual	Certificates	Warranty	Report	Other
Coatings		X		X			X		X	X		

1.4 QUALITY ASSURANCE

A. Single Source Responsibility: Provide primers and other undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer and use only within recommended limits.

B. Coordination of Work: Review other sections of these Specifications in which prime paints are to be provided to ensure compatibility of total coatings systems for various substrates. Upon request from other trades, furnish information or characteristics of finish materials provided for use, to ensure compatible prime coats are used.

1.5 DELIVERY AND STORAGE

A. Deliver materials to job site in original, new and unopened packages and containers bearing manufacturer's name and label, and following information:

1. Name or title of material.
2. Fed. Spec. number, if applicable.
3. Manufacturer's stock number, batch number, and date of manufacturer.
4. Manufacturer's name.
5. Contents by volume, for major pigment and vehicle constituents.
6. Thinning instructions.
7. Application instructions.
8. Color name and number.

B. Store materials not in actual use in tightly covered containers. Maintain containers used in storage of paint in a clean condition, free of foreign materials and residue. Protect from freezing where necessary. Keep storage area neat and orderly. Remove oily rags and waste daily. Take all precautions to ensure that workmen and work areas are adequately protected from fire hazards and health hazards resulting from handling, mixing and application of paints.

1.6 JOB CONDITIONS

A. Apply water-base paints only when temperature of surfaces to be painted and surrounding air temperatures are between 50 degrees F (10 degrees C) and 90 degrees F (32 degrees C), unless otherwise permitted or restricted by paint manufacturer's printed instructions.

B. Apply solvent-thinned paints only when temperature of surfaces to be painted and surrounding air temperatures are between 45 degrees F (7 degrees C) and 95 degrees F (35 degrees C), unless otherwise permitted or restricted by paint manufacturer's printed instructions.

C. Do not apply paint in snow, rain, fog or mist, or when relative humidity exceeds 85%, or to damp or wet surfaces, unless otherwise permitted or restricted by paint manufacturer's printed instructions. Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.

D. Paint only when the surface temperature is at least 5 degrees F above the dew point, unless otherwise permitted by paint manufacturer's printed instructions.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:

1. Tnemec Company, Inc. (Tnemec)
2. The Sherwin-Williams Company
3. Carboline

2.2 MATERIALS

A. Material Quality: Provide best quality grade of various types of coatings as regularly manufactured by acceptable paint materials manufacturers. Materials not displaying manufacturer's identification as a standard, best-grade product will not be acceptable.

B. Proprietary names used to designate colors or materials are not intended to imply that products of named manufacturers are required to exclusion of equivalent products of other manufacturers.

C. Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.

1. Lead content in pigment, if any, is limited to contain no more than 0.06 percent lead, as lead metal based on the total non-volatile (dry-film) of paint by weight.

PART 3 - EXECUTION

3.1 INSPECTION

A. Applicator must examine areas and conditions under which painting work is to be applied and notify Contractor in writing of conditions detrimental to proper and timely completion of work.

Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to Applicator.

B. Starting of painting work will be construed as Applicator's acceptance of surfaces and conditions within any particular area.

C. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

3.2 SURFACE PREPARATION

A. General: Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions and as herein specified, for each particular substrate condition.

1. Provide barrier coats over incompatible primers or remove and re-prime as required. Notify Architect-Architect-Engineer in writing of any anticipated problems in using the specified coating systems with substrates primed by others.
2. Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for complete painting of items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed items.
3. Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning per SSPC SP-1. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly-painted surfaces.
4. Abrasives for blasting shall be sharp, washed, salt free, angular, and free from feldspar or other constituents that tend to breakdown and remain on the surface.
5. Concrete floors shall be dry as indicated by testing in accordance with ASTM D4263, Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.

B. Cementitious Materials: Per ASTM D4261, Standard Practice for Surface Cleaning Concrete Unit Masonry for Coating, prepare cementitious surfaces of concrete block to be painted by removing efflorescence, chalk, dust, dirt, grease, oils, and by roughening as required to remove glaze. Per ASTM D4262, Standard Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces, determine alkalinity of surfaces to be painted by performing appropriate tests. If surfaces are found to be sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application of paint. Test the surface for moisture and do not paint over surfaces where moisture content exceeds that permitted in manufacturer's printed directions.

C. Wood: Clean wood surfaces to be painted of dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view, and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer, before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried.

1. Prime, stain, or seal wood required to be job-painted immediately upon delivery to job. Prime edges, ends, faces, undersides, and backsides of such wood, including cabinets, counters, cases, paneling.

2. When transparent finish is required, use spar varnish for backpriming.

D. Ferrous Metals: Clean ferrous surfaces, which are not galvanized or shop-coated, of oil, grease, dirt, and other foreign substances by solvent cleaning per SSPC SP-1. Mechanical cleaning shall be in accordance with SSPC-SP6 Commercial Blast Cleaning specifications for non-immersion surfaces and SSPC-SP10 Near White Metal Blast Cleaning for immersion in potable or non-potable water.

E. Galvanized Surfaces: Clean free of oil and surface contaminants with non-petroleum-based solvent. For immersion service, clean in accordance with SSPC-SP16 Brush-Off Blast Cleaning of Coated and Uncoated Galvanized Steel, Stainless Steels, and Non-Ferrous Metals.

F. Shop Primed Surfaces: Prepare shop-applied prime coats wherever damaged or bare as required by other sections of these Specifications. Clean and touch-up with same type shop primer.

3.3 MATERIALS PREPARATION

A. Mix and prepare painting materials in accordance with manufacturer's directions.

B. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.

C. Stir materials before application to produce a mixture of uniform density and stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

3.4 APPLICATION

A. General: Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Painting requirements, surface treatments, and finishes, are indicated in "schedules" of the contract documents and as noted in Paragraph 3.11 hereinafter.
2. Provide finish coats which are compatible with prime paints used.
3. Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently- fixed equipment or furniture with prime coat only before final installation of equipment.
5. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, non-specular black paint.
6. Paint back sides of access panels, and removable or hinged covers to match exposed surfaces.
7. Finish exterior doors on tops, bottoms and side edges same as exterior faces, unless otherwise indicated.
8. Sand lightly between each succeeding enamel or varnish coat.

9. Omit first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless otherwise indicated.

B. Scheduling Painting: Apply first-coat material to surfaces that have been cleaned, pretreated or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration. Allow sufficient time between successive coatings to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

C. Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as indicated or, if not indicated, as recommended by coating manufacturer.

D. Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to those items exposed in mechanical equipment rooms and in occupied spaces.

1. Mechanical items to be painted include, but are not limited to, the following:

a. Piping, pipe hangers, supplementary steel and supports except galvanized surfaces.
b. Heat exchangers.
c. Tanks.
d. Ductwork, insulation.
e. Motor, mechanical equipment, and supports.
f. Accessory items.

2. Electrical items to be painted include, but are not limited to, the following:

a. Conduits and fittings except galvanized surfaces.
b. Switchgear (touch up only).
c. Hanger and support except galvanized surfaces.

E. Prime Coats: Apply prime coat of material, which is required to be painted or finished, and which has not been prime coated by others. Recoat primed and sealed surfaces where there is evidence of suction spots or unsealed areas in first coat, to assure a finish coat with no burn-through or other defects due to insufficient sealing.

F. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness or other surface imperfections will not be acceptable. Holiday test coated steel in immersion areas in accordance with NACE International SP0188-2007 Discontinuity (Holiday) Testing of New Protective Coatings on Conductive Substrates.

G. Transparent (Clear) Finishes: Use multiple coats to produce glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections. Provide satin finish for final coats, unless otherwise indicated.

H. Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

3.5 FIELD QUALITY CONTROL

A. The right is reserved by Owner to invoke the following material testing procedure at any time, and any number of times during period of field painting:

1. Engage services of an independent testing laboratory to sample paint being used. Samples of materials delivered to project site will be taken, identified and sealed, and certified in presence of Contractor.
2. Testing laboratory will perform appropriate tests for any or all of the following characteristics: abrasion resistance, apparent reflectivity, flexibility, washability, absorption, accelerated weathering, dry opacity, accelerated yellowness, recoating, skinning, color retention, alkali resistance and quantitative materials analysis.

B. If test results show that material being used does not comply with specified requirements, Contractor may be directed to stop painting work and remove non-complying paint; pay for testing; repaint surfaces coated with rejected paint; remove rejected paint from previously painted surfaces if, upon repainting with specified paint, the two coatings are non-compatible.

3.6 CLEAN-UP AND PROTECTION

A. Clean-Up: During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each workday.

B. Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

C. Protection: Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect-Architect-Engineer. Provide "Wet Paint" signs as required to protect newly-painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations. At completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

3.7 PAINTING SYSTEMS

A. Ferrous Metals, Structural, Tanks, Pipe and Equipment

1. Exterior, Non-Immersion

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	SSPC-SP6 Commercial Blast Cleaning		SSPC-SP6 Commercial Blast Cleaning		SSPC-SP6 Commercial Blast Cleaning	
1st Coat	91H20	2.5 - 3.5	Corothane I Galvapac or Macropoxy 5500	2.5 - 3.5	Carbozinc 859	2.5 - 3.5
2nd Coat	N69 High-Build Epoxoline	4.0 - 6.0	Macropoxy 646	4.0 - 6.0	Carboguard 60	4.0 - 6.0
3rd Coat	1074 Endura -Shield	2.0 - 3.0	Acrolon 218 HS	2.0 - 3.0	Carbothane 134 HG	2.0 - 3.0

2. Interior, Non-Immersion

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	SSPC-SP6 Commercial Blast Cleaning		SSPC-SP6 Commercial Blast Cleaning		SSPC-SP6 Commercial Blast Cleaning	
1st Coat	91H20	2.5 - 3.5	Corothane I Galvapac or Macropoxy 5500	2.5 - 3.5	Carbozinc 859	2.0 - 3.0
2nd Coat	N69 High-Build Epoxoline	4.0 - 6.0	Macropoxy 646	4.0 - 6.0	Carboguard 60	4.0 - 6.0
3rd Coat	N69 High-Build Epoxoline	2.0 - 3.0	Macropoxy 646	2.0 - 3.0	Carboguard 60	2.0 - 3.0

3. Immersion, Potable or Non-Potable Water

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	SSPC-SP10 Near-White Blast Cleaning		SSPC-SP10 Near-White Blast Cleaning		SSPC-SP10 Near-White Blast Cleaning	
1st Coat	N140	4.0 -6.0	Macropoxy 646 PW or 5500	4.0 - 6.0	Hydroplate 1086	4.0 - 6.0
2nd Coat	N140	4.0 - 6.0	Macropoxy 646 PW or 5500	4.0 - 6.0	Hydroplate 1086	4.0 - 6.0
3rd Coat	N140	4.0 - 6.0	Macropoxy 646 PW or 5500	4.0 - 6.0	Hydroplate 1086	4.0 - 6.0

4. Factory Primed Interior (Refer to Piping Specifications)

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	Surface Shall be Clean/Dry		Surface Shall be Clean/Dry		Surface Shall be Clean/Dry	
Touch up	N69 High-Build Epoxoline		Macropoxy 646		Carboguard 60	
1st Coat	N69 High-Build Epoxoline	4.0 - 6.0	Macropoxy 646	4.0 - 6.0	Carboguard 60	4.0 - 6.0
2nd Coat	N69 High-Build Epoxoline	4.0 - 6.0	Macropoxy 646	4.0 - 6.0	Carboguard 60	4.0 - 6.0

5. Factory Primed, Exterior (Refer to Piping Specifications)

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	Surface Shall be Clean/Dry		Surface Shall be Clean/Dry		Surface Shall be Clean/Dry	
Touch up	N69 Hi-Build Epoxoline		Macropoxy 646		Carboguard 60	
1st Coat	N69 Hi-Build Epoxoline	4.0 - 6.0	Macropoxy 646	4.0 - 6.0	Carboguard 60	4.0 - 6.0
2nd Coat	1074 Endura -Shield	2.0 - 3.0	Acrolon 218 HS, B65 Series	2.0 - 3.0	Carbothane 134 HG	2.0 - 3.0

6. Primed Steel (Doors, Frames, etc.) - Exterior

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	Surface Shall be Clean/Dry		Surface Shall be Clean/Dry		Surface Shall be Clean/Dry	
Touch-up	N69 High-Build Epoxoline		Macropoxy 646		Carboguard 60	
1st Coat	N 69 High-Build Epoxoline	4.0 - 6.0	Macropoxy 646	2.0 - 3.0	Carboguard 60	4.0 - 6.0
2nd Coat	1074 Endura -Shield	2.0 - 3.0	Acrolon 218 HS	2.0 - 3.0	Carbothane 134 HG	2.0 - 3.0

7. Buried

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	SSPC-SP6 Commercial Blast Cleaning		SSPC-SP6 Commercial Blast Cleaning		SSPC-SP6 Commercial Blast Cleaning	
1st Coat	Hi-Build Tneme-Tar	16.0 - 20.0	Hi-Mil Sher-Tar Epoxy	16.0 - 24.0	Bitumastic 300M	16.0 - 24.0

B. Galvanized Steel - Pipe and Miscellaneous Fabrications

1. Exterior, Non-Immersion

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	SSPC-SP1 Solvent Cleaning		SSPC-SP1 Solvent Cleaning		SSPC-SP1 Solvent Cleaning	
1st Coat	N69 Hi-Build Epoxoline	4.0 - 6.0	Macropoxy 646	2.0 - 3.0	Carboguard 60	4.0 - 6.0
2nd Coat	1074 Endura -Shield	2.0 - 3.0	Acrolon 218 HS	2.0 - 3.0	Carbothane 134 HG	2.0 - 3.0

2. Interior, Non-Immersion (Doors, Frames, etc.)

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	SSPC-SP1 Solvent Cleaning		SSPC-SP1 Solvent Cleaning		SSPC-SP1 Solvent Cleaning	
1st Coat	N69 Hi-Build Epoxoline	4.0 - 6.0	Macropoxy 646	2.0 - 3.0	Carboguard 60	4.0 - 6.0
2nd Coat	N69 Hi-Build Epoxoline	4.0 - 6.0	Macropoxy 646	2.0 - 3.0	Carboguard 60	2.0 - 3.0

3. Immersion, Potable or Non-Potable Water

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	SSPC-SP16 Brush-Off Blast Cleaning		SSPC-SP16 Brush-Off Blast Cleaning		SSPC-SP16 Brush-Off Blast Cleaning	
1st Coat	20-1255 Potapox	4.0 - 6.0	Macropoxy 646 PW or 5500	4.0 - 6.0	Hydroplate 1086	4.0 - 6.0
2nd Coat	20-11 WH Potapox	4.0 - 6.0	Macropoxy 646 PW or 5500	4.0 - 6.0	Hydroplate 1086	4.0 - 6.0

C. Porous Masonry - Concrete Masonry Units

1. Interior

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	Surface Shall be Clean/Dry		Surface Shall be Clean/Dry		Surface Shall be Clean/Dry	
1st Coat	130 Envirofill (Spray and Back Roll to Fill Porosity)	80 - 100 sf/gal.	Heavy Duty Block Filler or Cement-Plex 875	80 - 100 sf/gal	Carboline Sanitile 100	80 - 100 sf/gal
2nd Coat	113 H.B. Tneme-Tufcoat	2.0 - 3.0	Pro-Industrial Water Based Catalyzed Epoxy	2.0 - 3.0	Sanitile 255	2.0 - 3.0
3rd Coat	113 H.B. Tneme-Tufcoat	2.0 - 3.0	Pro-Industrial Water Based Catalyzed Epoxy	2.0 - 3.0	Sanitile 255	2.0 - 3.0

2. Exterior

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	Surface Shall be Clean/Dry		Surface Shall be Clean/Dry		Surface Shall be Clean / Dry	
1st Coat	Series 156 Enviro-Crete	6.0 - 8.0*	Loxon XP	6.0 - 8.0*	Flexxide Elastomer	6.0 - 8.0*
2nd Coat	Series 156 Enviro-Crete	6.0 - 8.0*	Loxon XP	6.0 - 8.0*	Flexxide Elastomer	6.0 - 8.0*

*Coats must be sufficient to fill the porosity of the block face and create a pinhole-free surface.

D. Cast-In-Place Concrete

1. Concrete Walls & Precast Concrete Ceilings (Interior)

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	SSPC-SP13 Abrasive Blast		SSPC-SP13 Abrasive Blast		SSPC-SP13 Abrasive Blast	
1st Coat	113 H.B. Tneme Tuf-Coat	4.0 - 6.0	Pro-Industrial Water Based Catalyzed Epoxy	2.0 - 4.0	Sanitile 255	2.0 - 3.0
2nd Coat	113 H.B. Tneme Tuf-Coat	4.0 - 6.0	Pro-Industrial Water Based Catalyzed Epoxy	2.0 - 4.0	Sanitile 255	2.0 - 3.0

2. Concrete Walls, Exterior & Non-Potable

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	Surface Shall be Clean/Dry		Surface Shall be Clean/Dry		Surface Shall be Clean/Dry	
1st Coat	Series 156 Enviro-Crete	125 sf/gal	Loxon Masonry Primer	125 sf/gal	Flexxide Elastomere	125 sf/gal
2nd Coat	Series 156 Enviro-Crete	200 sf/gal	Loxon Masonry Coating	200 sf/gal	Flexxide Elastomere	200 sf/gal

3. Concrete Floors

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	Pressure Wash					
1st Coat	ChemProbe CT Densifyer Series 629 or 617		H&C Waterbased Solid Color Stain or Rexthane Clear			
2nd Coat	ChemProbe CT Densifyer Series 629 or 617		H&C Waterbased Solid Color Stain or Rexthane Clear			

4. Concrete Tanks & Basins

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	SSPC-SP13, Severe Service Abrasive Blast		SSPC-SP13, Severe Service Abrasive Blast		SSPC-SP13, Severe Service Abrasive Blast	
1st Coat	N140	4.0 - 6.0	Macropoxy 646 PW or 5500	4.0 - 6.0	Hydroplate 1086	4.0 - 6.0
2nd Coat	N140	4.0 - 6.0	Macropoxy 646PW or 5500	4.0 - 6.0	Hydroplate 1086	4.0 - 6.0
3rd Coat	N140	4.0 - 6.0	Macropoxy 646PW or 5500	4.0 - 6.0	Hydroplate 1086	4.0 - 6.0

5. Chemical Containment Areas - Acid Exposure

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	SSPC-SP13, Severe Service Abrasive Blast		SSPC-SP13, Severe Service Abrasive Blast		SSPC-SP13, Severe Service Abrasive Blast	
1st Coat	Series 120-5002 Vinyl Ester	12 - 18	CoroBond Vinyl Ester Primer	3.5 - 4.0	Semstone 800	8.0 -10.0
2nd Coat	Series 120-5002 Vinyl Ester	12 - 18	CorCote VEN FF	15.0 - 20.0	Semstone 870 (aggregate-filled)	25.0 - 30.0
3rd Coat			CorCote VEN FF with Wax Solution	15.0 - 20.0	Semstone 870	15.0 - 20.0

6. Chemical Containment Areas - Other

	Tnemec	Dry Mils	Sherin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	SSPC-SP13, Severe Service Abrasive Blast		SSPC-SP13, Severe Service Abrasive Blast		SSPC-SP13, Severe Service Abrasive Blast	
1st Coat	201 Epoxoprime	6.0 - 8.0	CoroBond 100	6.0 - 8.0	Semstone 110	8.0 - 10.0
2nd Coat	275 Stranlock	25.0 - 40.0	CorCote HCR Flake-Filled	15.0 - 20.0	Semstone 145 SL	25 mils (Broadcast Silica)
3rd Coat	282 Tneme-Glaze	8.0 - 12.0	CorCote HCR	15.0 - 20.0	Semstone 145 SL	15.0 - 25.0

E. Wood

1. Interior or Exterior

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	Surface Shall be Clean/Dry		Surface Shall be Clean/Dry		Surface Shall be Clean/Dry	
1st Coat	151-1051 Elasto-Grip FC	1.0 - 1.5	Multi-Purpose Latex Primer	1.0 - 1.5	Carbocrylic 120	1.0 - 2.0
2nd Coat	1029 Tufcryl	2.0-3.0 - 3.5	Pro Industrial DTM Acrylic Coating	2.0 - 3.0	Carbocrylic 3359 DTM	2.0 - 3.0
3rd Coat	1029 Tufcryl	2.0 - 3.0	Pro Industrial DTM Acrylic Coating	2.0 - 3.0	Carbocrylic 3359 DTM	2.0 - 3.0

F. Insulated Pipe

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	Surface Shall be Clean/Dry		Surface Shall be Clean/Dry		Surface Shall be Clean/Dry	
1st Coat	1029 Tneme-Cryl	2.0 - 3.0	DTM Primer/Finish, B66W1	2.0 - 3.0	Carbocrylic 120	1.0 - 2.0
2nd Coat	1029 Tneme-Cryl	2.0 - 3.0	DTM Primer/Finish, B66W1	2.0 - 3.0	Carbocrylic 3359 DTM	2.0 - 3.0

G. Gypsum Board

1. Interior Drywall - Architectural

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	Surface Shall be Clean/Dry		Surface Shall be Clean/Dry		Surface Shall be Clean/Dry	
1st Coat	151-1051 Elasto-Grip FC	1.0 - 1.5	Promar 200 Printer	1.0 - 1.5	Carbocrylic 120	1.0 - 2.0
2nd Coat	6-Color Tneme-Cryl	2.0 - 3.0	ProMar 200 F, SF, EgShel	1.0 - 1.5	Carbocrylic 3359 DTM	2.0 - 3.0

2. Interior Drywall - Severe Exposure

	Tnemec	Dry Mils	Sherwin Williams	Dry Mils	Carboline	Dry Mils
Surface Prep	Surface Shall be Clean/Dry		Surface Shall be Clean/Dry		Surface Shall be Clean/Dry	
Prime Coat	151-1051 Elasto-Grip FC	1.0 - 1.5	Promar 200 Primer	1.0 - 1.5	Sanitile 120	1.0 - 2.0
1st Coat	113 H.B. Tneme-Tufcoat	2.0 - 3.0	Pro-Industrial Water Based Catalyzed Epoxy	2.0 - 3.0	Carboline Sanitile 255	2.0 - 3.0
2nd Coat	113 H.B. Tneme-Tufcoat	2.0 - 3.0	Pro-Industrial Water Based Catalyzed Epoxy	2.0 - 3.0	Carboline Sanitile 255	2.0 - 3.0

H. PVC Piping - Do Not Paint

I. Aluminum Windows, Doors, Handrails & Grating - Do Not Paint

J. Fiberglass Reinforced Plastic Doors & Windows - Do Not Paint

3.8 PIPING COLOR CODE

A. To facilitate identification of piping in plants and pumping stations it is recommended that the following color scheme be utilized:

WATER LINES	
Raw Water	Olive Green
Settled Water	Light Blue
Filtered, Finished or Potable Water	Dark Blue

CHEMICAL LINES	
Alum or Primary Coagulant	Orange
Ammonia	White
Carbon Slurry	Black
Caustic	Yellow w/green band
Chlorine	Yellow
Lime Slurry	Light Green
Fluoride	Light Blue w/red band
Polymers or Coagulant Aid	Orange w/ green band
Potassium Permanganate	Violet
Soda Ash	Light Green w/orange band
Sulfur Dioxide	Light Green w/yellow band

WASTE LINES	
Backwash Waste	Light Brown
Sewer (Sanitary or Other)	Dark Gray
Sludge	Dark Brown

OTHER	
Compressed Air	Dark Green
Gas	Red
Other Lines	Light Gray

3.9 STENCILING

A. The Contractor shall supply all materials and labor necessary for stenciling of legends on pipes. The legend shall show the name of the contents. Review by the Architect-Engineer of legends will be required. Names shall be "plainly visible". Arrows showing direction of flow shall also be stenciled on pipes. The legends shall be located not more than 10 feet apart and, in general, at each valve and piece of equipment. The size and location of the legend shall be in general accordance with ANSI A13.1-1981 "Scheme for the Identification of Piping Systems". All visible piping 6 inches in diameter and larger shall be color-coded and stenciled. "Stick-on" labels are not acceptable.

3.10 PLASTIC IDENTIFICATION MARKERS

A. All visible piping 3/4 inch and greater and less than 6 inches which is accessible for maintenance operations shall be color-coded and identified with semi-rigid plastic identification markers equal to SETMARK Pipe Markers as manufactured by Seton Name Plate Corporation, New Haven, Conn.; T & B/Westline, Los Angeles, California; or equal. Direction of flow arrows are to be included on each marker, unless otherwise specified.

B. Each marker background is to be appropriately color coded with a clearly printed legend to identify the contents of the pipe in conformance with the "Scheme for the Identification of Piping Systems" (ANSI A 13.1 - 1981).

C. For pipes under 3/4 inch O.D. (too small for color bands and legends), brass identification tags 1-1/2 inches in diameter with depressed 1/4-inch-high black filled letters above 1/3-inch black filled numbers shall be fastened securely at specified locations.

D. All electrical conduits, which are accessible for maintenance operations, shall be identified with semi-rigid identification markers similar to those specified above.

E. Each marker background is to be color-coded with a clearly printed legend to identify the conductor. Size of markers and sizes of lettering to generally conform with the "Scheme for Identification of Piping Systems" (ANSI A 13.1 - 1981)

F. Locations for pipe and electrical markers to be as follows:

1. Adjacent to each valve and fitting (except on plumbing fixtures and equipment).
2. At each branch and riser take-off.
3. At each pipe passage through wall, floor and ceiling construction.
4. At each pipe passage to underground.
5. On all horizontal pipe runs-marked every 25 feet.

3.11 PAINT SCHEDULE

All items at the Project site shall be painted in accordance with these Specifications and Drawings. The following paint schedule is provided only to assist the Owner and Contractor in selection of the appropriate paint system and is not intended to be a complete list of items to be painted.

A. Paint Application Schedule

1. Check Valve Vault

Location and/or Description		System
a.	Concrete	Do Not Paint
b.	Piping & Equipment	A
c.	Aluminum Hatches	Do not Paint

END OF SECTION 099600

DIVISION 10

SPECIALTIES

SECTION 107445 – ACCESS HATCHES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment, and service required for the complete installation of the access hatches as specified herein and shown on the Drawings.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Cast-in-Place Concrete: Section 033300

B. Precast Concrete Structures: Section 034000

1.3 SUBMITTALS

A. Submit manufacturer's data and shop drawings for the materials specified herein. Comply with all requirements of Section 013323.

B. 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.

C. At the time of submission, the Contractor shall, in writing, call the Engineer's attention to any deviations that the submittals may have from the requirements of the Engineer's Contract Drawings and Specifications.

D. In accordance with the requirements of the General and Special Conditions and this Section, the following table includes, but is not limited to, the items required to be submitted:

Item Description	Shop Drawings	Product Data	Schedules	Installation Data	Parts Lists	Wiring Diagram	Samples	O & M Manual	Certificates	Warranty	Report	Other
Access Hatches	X	X		X						X		

1.4 ACCEPTABLE MANUFACTURERS

A. Access hatches shall be as manufactured by the Bilco Company, New Haven, Connecticut; Halliday Products, Orlando, Florida; Milcor Division Inryco, Inc., Milwaukee, Wisconsin; Nystrom, Minneapolis Minnesota or equal.

1.5 WARRANTY

A. The guaranty period shall be as set forth in specification Section 011400, "General Provisions". In the event the manufacturer's guarantee period exceeds that as stated in the General Provisions, the manufacturer's guarantee period will stay in effect and shall not be replaced by that previously stated.

PART 2 - PRODUCTS

2.1 H-20 ACCESS HATCH FOR CHECK VALVE VAULT

A. Access hatch shall be double leaf or single leaf, as indicated on the Contract Drawings or by the Engineer, aluminum, gutter type, watertight, exterior, flush floor hatch design. Door leaves shall be 1/4 inch aluminum diamond pattern plate to withstand a live load of the H-20, uniform live load. Channel frames shall be 1/4 inches aluminum with an anchor flange around the perimeter. Provide 1-1/2 inch female NPT threaded aluminum drainage coupling welded under frame at right front corner for connection of drain pipe. Drain pipe shall be drained to daylight.

B. Door shall be equipped with 316 stainless steel hinges, a lockable hasp for use with a padlock, stainless steel pins, spring operator for easy operation and an automatic hold-open arm with release handle. Provide inside stainless steel snap locks with removable wrench lift handle outside. Furnish threaded aluminum plug to seal lock aperture. Hardware shall be cadmium plated.

C. Doors and frames shall be mill finish with coating applied to the exterior of the frame. Hatches shall have an odor resistant gasket.

D. Access Hatch shall be furnished with a factory installed fall-through prevention system (FTPS). The FTPS must be able to withstand a live load of 300 pounds per sq. ft., be of aluminum "I" bar construction with safety orange powder-coating finish, and have 316 stainless steel mounting hardware. The lifting handle shall be spring loaded, and the system shall be hinged with an automatic hold open arm to maintain an upright position, as well as be lockable with owner supplied padlock.

E. For a schedule of Check Valve Vault hatch, see below:

STRUCTURE	Clear unobstructed opening: (Width X Length)	NO. OF HATCHES	LEAF
Check Valve Vault	3'-0" x 4'-0"	1	Double

PART 3 - EXECUTION

3.1 GENERAL

A. Installation shall be in accordance with manufacturer instructions.

B. Manufacturer shall guarantee against defects in material of workmanship for a period of five years.

C. Unit shall be set with slight pitch toward drain. Furnish and install 1 inch diameter schedule 80 PVC plastic drainage pipe and fittings to connect to gutter drainage coupling, set in concrete and run outside vault to daylight.

END OF SECTION 107445

DIVISION 31

EARTHWORK

SECTION 312000 – EARTHWORK

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all materials, labor, equipment and services necessary to do all clearing and grubbing, excavation, backfilling, additional fill material and topsoil, control of surface drainage and ground water, finished site grading and erosion control required to construct the work as shown.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. State and local code requirements shall control the disposal of trees and shrubs.

B. All burning shall be controlled by applicable local regulations.

C. Excavation Support and Protection: Section 315000

D. Erosion and Sedimentation Control: Section 312500

1.3 JOB CONDITIONS

A. Weather: Earthwork operations shall be suspended at any time when satisfactory results cannot be obtained on account of rain, snow, ice, drought or other adverse weather conditions.

B. Existing Utilities: Prior to commencement of work, the Contractor shall locate existing underground utilities in areas of the work. If utilities are to remain in place, provide adequate means of protection during earthwork operations.

C. Use of Explosives: The Contractor (or any of their subcontractors) shall not bring explosives onto site or use in work without prior written permission from the Owner. All activities involving explosives shall be in compliance with the rules and regulations of the State Department of Mines and Minerals, Division of Explosives and Blasting. Contractor is solely responsible for handling, storage, and use of explosive materials when their use is permitted.

D. Protection of Persons and Property:

1. Barricade open excavations occurring as part of this work and post with warning lights.

    a. Operate warning lights as recommended by authorities having jurisdiction.
    b. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

E. Dust Control: Use all means necessary to control dust on or near the project site where such dust is caused by the Contractor's operations or directly results from conditions left by the Contractor.

1.4 UTILITY LINE ACTIVITIES COVERED UNDER NATIONWIDE PERMIT # 12

All activities involving utility line construction covered under NATIONWIDE PERMIT # 12 shall meet the following conditions:

A. The general Water Quality Certification is limited to the crossing of intermittent and perennial streams by utility lines.

B. The construction of permanent or temporary access roads will impact less than 300 linear feet of intermittent and perennial streams and less than one acre of jurisdictional wetlands.

C. Utility lines shall be located at least 50 feet away from a stream which appears as a blue line on a USGA 7-1/2-minute topographic map except where the utility line alignment crosses the stream. Utility lines that cross streams shall be constructed by methods that maintain normal stream flow and allow for a dry excavation. Water pumped from the excavation shall be contained and allowed to settle prior to re-entering the stream. Excavation equipment and vehicles shall operate outside of the flowing portion of the stream. Spoil material from the utility line excavation shall not be allowed to enter the flowing portion of the stream.

D. The activities shall not result in any permanent changes in preconstruction elevation contours in waters or wetlands or stream dimension, pattern or profile.

E. Utility line construction projects through jurisdictional wetlands shall not result in conversion of the area to non-wetland status.

F. Measures shall be taken to prevent or control spills of fuels, lubricants, or other toxic materials used in construction form entering the watercourse.

G. Removal of riparian vegetation in the utility line right-of-way shall be limited to that necessary for equipment access. Effective erosion and sedimentation control measures must be employed at all times during the project to prevent degradation of waters of the Commonwealth. Site regarding and reseeding will be accomplished with 14 days after disturbance.

H. To the maximum extent practicable, all in-stream work under this certification shall be performed during low flow.

I. Heavy equipment, e.g. bulldozers, backhoes, draglines, etc., if required for this project, should not be used or operated within the stream channel. In those instances where such in stream work is unavoidable, then it shall be performed in such a manner and duration as to minimize turbidity and disturbance to substrates and bank or riparian vegetation.

J. Any fill shall be of such composition that it will not adversely affect the biological, chemical, or physical properties of the receiving waters and/or cause violations of water quality standards. If riprap is utilized, it is to be of such weight and size that bank stress or slump conditions will not be created because of its placement.

K. Removal of existing riparian vegetation should be restricted to the minimum necessary for project construction.

L. Should evidence of stream pollution or jurisdictional wetland impairment and/or violations of water quality standards occur as a result of this activity (either from a spill or other forms of water pollution), the Kentucky Division of Water shall be notified immediately by calling (800) 928-2380.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Definitions:

1. Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, SP, GC, SC, ML, and CL.
2. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups MH, CH, OL, OH and PT. The Contractor shall notify the Engineer if these soil materials are encountered.
3. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, natural or crushed sand.
4. Drainage Fill: Washed, evenly graded mixture of crushed stone, or uncrushed gravel, with 100 percent passing a 1/2-inch sieve and not more than 5 percent passing a No. 4 sieve.
5. Backfill and Fill Materials: Satisfactory soil materials free of debris, waste, frozen materials, vegetable, and other deleterious matter.

PART 3 - EXECUTION

3.1 CLEARING AND GRUBBING

A. Work shall consist of cutting and removing designated trees, stumps, brush, logs, removal of fences, or other loose and projecting material. Unless otherwise specified, it shall also include the grubbing of stumps, roots, and other natural obstructions which, in the opinion of the Engineer, must be removed to execute properly the construction work and operate properly the facility upon the completion of construction.

B. Trees, bushes, and all-natural vegetation shall only be removed with the approval of the Engineer. No cleared or grubbed materials shall be used in backfills or embankment fills. All stumps, roots, and other objectionable material shall be grubbed up so that no roots larger than 3 inches in diameter remain less than 18 inches below the ground surface. All holes and depressions left by grubbing operations shall be filled with suitable material and compacted to grade, as recommended in Paragraph 3.6.

C. Disposal shall be by burning or other methods satisfactory to the Engineer; however, burning will be permitted only when the Contractor has obtained written permission from the local regulatory agency.

D. The Contractor shall also remove from the site and satisfactorily dispose of all miscellaneous rubbish including, but not limited to, masonry, scrap metal, rock, pavement, etc., that is under

the fill or to be removed as shown on the Drawings, specified herein, or directed by the Engineer.

E. Existing improvements, adjacent property, utility and other facilities, and trees, plants, and brush that are not to be removed shall be protected from injury or damage resulting from the Contractor's operations.

F. Trees and shrubs, designated to remain or that are beyond the clearing and grubbing limit, which are injured or damaged during construction operations shall be treated or replaced at the Contractor's expense by experienced tree surgery personnel.

3.2 EROSION CONTROL

A. Temporary measures shall be applied throughout the construction period to control and to minimize siltation to adjacent properties and waterways. Such measures shall include, but not be limited to, the use of berms, silt barriers, gravel or crushed stone, mulch, slope drains and other methods.

B. These temporary measures shall be applied to erodible material exposed by any activity associated with the construction of this project.

C. Refer to Section 312500 - Erosion and Sedimentation Control for requirements.

3.3 EXCAVATION

A. Excavation of every description and of whatever substances encountered within the grading limits of the project shall be performed to the lines and grades indicated on the Drawings. All excavation shall be performed in the manner and sequence as required for the work.

B. All excavated materials that meet the requirements for fill, subgrades or backfill shall be stockpiled within the site for use as fill or backfill, or for providing the final site grades. Where practicable, suitable excavated material shall be transported directly to any place in the fill areas within the limits of the work. All excavated materials that are not suitable for fill, and any surplus of excavated material that is not required for fill shall be disposed of by the Contractor.

C. The site shall be kept free of surface water at all times. The Contractor shall install drainage ditches, dikes and shall perform all pumping and other work necessary to divert or remove rainfall and all other accumulations of surface water from the excavations. The diversion and removal of surface water shall be performed in a manner that will prevent flooding and/or damage to other locations within the construction area where it may be detrimental. The Contractor shall provide, install and operate sufficient trenches, sumps, pumps, hose piping, well points, deep wells, etc., necessary to depress and maintain the ground water level at least 2 feet below the base of the excavation during all stages of construction operations. The ground water table shall be lowered in advance of excavation and maintained a minimum of 2 feet below the lowest excavation subgrade made until the excavation is backfilled or the structure has sufficient strength and weight to withstand horizontal and vertical soil and water pressures from natural ground water.

D. Excavations for concrete structural slabs on grade shall extend 2 feet below the indicated bottom of slabs. The over-excavation shall be backfilled with 18 inches, compacted thickness, of over lot fill material or suitable material as herein specified. The remaining 6 inches of over-excavation shall be backfilled with porous fill material. The porous fill layer shall extend beyond the limits of the concrete slab a minimum of 2 feet on all sides as indicated on the Drawings. The porous fill shall be crushed stone or gravel and shall have the following U.S. Standard Sieve gradation:

Sieve	1-1/2	1	3/4	1/2	3/8
% Passing	Min 100	95±5	58±17	Max 15	Max 5

E. Excavations for the construction shall be carefully made to the depths required. Bottoms for footings and grade beams shall be level, clean and clear of loose material, the lower sections true to size. Bottoms of footings and grade beams, in all locations, shall be at a minimum depth of 30 inches below adjacent exterior finished grade or 30 inches below adjacent existing grade, whichever is lower, whether so indicated or not. Footings and grade beam bottoms shall be inspected by the Engineer before any concrete is placed thereon.

F. In excavations for structures where, in the opinion of the Engineer, the ground is spongy or otherwise unsuitable for the contemplated foundation, the Contractor shall remove such unsuitable material and replace it with suitable material properly compacted.

G. Sheeting and shoring shall be provided as necessary for the protection of the work and for the safety of the personnel. The clearances and types of the temporary structures, insofar as they affect the character of the finished work, will be subject to the review of the Engineer, but the Contractor shall be responsible for the adequacy of all sheeting, bracing and cofferdamming. All shoring, bracing and sheeting shall be removed as the excavations are backfilled in a manner such as to prevent injurious caving, or if directed by the Engineer, shall be left in place. Sheeting left in place shall be cut off 18 inches below the surface.

H. Excavation for structures which have been carried below the depths indicated without specific instructions shall be refilled to the proper grade with suitable material properly compacted, except that in excavation for columns, walls or footings, the concrete footings shall extend to this lower depth. All work of this nature shall be at the Contractor's expense.

3.4 FILL

A. All existing fill below structures and paved areas must be stripped. The upper 6 inches of the natural subgrade below shall be scarified and recompacted at optimum moisture to at least 95 percent of Standard Proctor Density ASTM D 698 (latest revision).

B. All vegetation, such as roots, brush, heavy sods, heavy growth of grass and all decayed vegetable matter, rubbish and other unsuitable material within the area upon which fill is to be placed shall be stripped or otherwise removed before the fill is started. In no case will such objectionable material be allowed to remain in or under the fill area. Existing fill from excavated areas on site shall be used as fill for open and/or planted areas. Additional fill stockpiled at the site can be used for structural fill if approved by the Engineer. Any additional material necessary for establishing the indicated grades shall be furnished by the Contractor and approved by the Engineer. All fill material shall be free from trash, roots and other organic material. The best material to be used in fills shall be reserved for backfilling pipelines and for

finishing and dressing the surface. Material larger than 3 inches maximum dimension shall not be permitted in the upper 6 inches of the fill area. Fill material shall be placed in successive layers and thoroughly tamped or rolled in a manner approved by the Engineer, each layer being moistened or dried such that the specified degree of compaction shall be obtained. No fill shall be placed or compacted in a frozen condition or on top of frozen material. No fill material shall be placed when free water is standing on the surface of the area where the fill is to be placed and no compaction of fill will be permitted with free water on any point of the surface of the fill to be compacted.

C. Where concrete slabs are placed on earth, all loam and organic or other unsuitable material shall be removed. Where fill is required to raise the subgrade for concrete slabs to the elevations as indicated on the Drawings or as required by the Engineer, such fill shall consist of suitable material and shall be placed in layers. Each layer shall be moistened or dried such that the specified degree of compaction shall be obtained. All compaction shall be accomplished in a manner and with equipment as approved by the Engineer. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for adjacent fill.

3.5 BACKFILLING

A. After completion of footings, grade beams and other construction below the elevation of the final grades and prior to backfilling, all forms shall be removed, and the excavation shall be cleaned of all trash and debris. Material for backfilling shall be as specified for suitable material, placed and compacted as specified hereinafter. Backfill shall be placed in horizontal layers of the thickness specified and shall have a moisture content such that the required degree of compaction is obtained. Each layer shall be compacted by mechanical tampers or by other suitable equipment approved by the Engineer to the specified density. Special care shall be taken to prevent wedging action or eccentric loading upon or against the structure. Trucks and machinery used for grading shall not be allowed within 45 degrees above the bottom of the footings or grade beams.

B. The trenches shall be backfilled following visual inspection by the Engineer and prior to pressure testing. The trenches shall be carefully backfilled with the excavated materials approved for backfilling, or other suitable materials, free from large clods of earth or stones. Each layer shall be compacted to a density at least equal to that of the surrounding earth and in such a manner as to permit the rolling and compaction of the filled trench with the adjoining earth to provide the required bearing value, so that paving, if required, can proceed immediately after backfilling is completed.

3.6 COMPACTION

A. Suitable material as hereinbefore specified shall be placed in maximum 8-inch horizontal layers. Compaction shall be performed by rolling with approved tamping rollers, pneumatic-tired rollers, three-wheel power rollers or other approved equipment. The degree of compaction required is expressed as a percentage of the maximum dry density obtained by the test procedure presented in ASTM D-698. Laboratory moisture density tests shall be performed on all fill material. Material shall be moistened or aerated as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction. Compaction requirements shall be as specified below:

Fill Utilized For	Required Density (%)	Maximum Permissible Lift Thickness As Compacted, Inches
Backfill & Utility Trenches Under Foundations & Pavement	95-100	8
Backfill Around Structures	95-100	8
Field and Utility Trench Backfill Under Sidewalk and Open Areas	90-100	8

B. Field density tests shall be performed in sufficient number to ensure the specified density is being obtained. Tests shall be in accordance with ASTM Standards D 1556 or D 2922/D 3017 and shall be performed as authorized by the Engineer. Payment for field density tests shall be by the Contractor. Contractor shall provide suitable notification for coordination of testing. Delays due to the lack of adequate advance notification shall be the responsibility of the Contractor.

3.7 SITE GRADING

A. Where indicated or directed, topsoil shall be removed without contamination with subsoil and spread on areas already graded and prepared for topsoil or transported and stockpiled convenient to areas for later application, or at locations specified. Topsoil shall be stripped to full depth and, when stored, shall be kept separate from other excavated materials and piled free of roots, stones, and other undesirable materials.

B. Following stripping, fill areas shall be scarified to a minimum depth of 6 inches to provide bond between existing ground and the fill material. Material should be placed in successive horizontal layers not exceeding 12 inches uncompacted thickness. In general, layers shall be placed approximately parallel to the finished grade line.

C. In general, and unless otherwise specified, the Contractor may use any type of earth moving equipment they have at their disposal, provided such equipment is in satisfactory condition and of such type and capacity that the work may be accomplished properly and the grading schedule maintained. During construction, the Contractor shall route equipment at all times, both when loaded and empty, over the layers as they are placed, and shall distribute the travel evenly over the entire area.

D. The material in the layers shall be of the proper moisture content before rolling or tamping to obtain the prescribed compaction. Wetting or drying throughout the layer shall be required. Should the material be too wet to permit proper compaction or rolling, all work on the fill thus affected shall be delayed until the material has dried to the required moisture content. If the material is too dry, it shall be sprinkled with water and manipulated to obtain the uniform moisture content required throughout a layer before it is compacted.

E. Each layer of the fill shall be compacted by rolling or tamping to the standard specified in Paragraph 3.6 and not less than 90 percent maximum density at optimum moisture content as determined by field density tests made by the Standard Proctor method. In general, and unless otherwise specified, the Contractor may use any type of compaction equipment such as

sheepsfoot rollers, pneumatic rollers, smooth rollers and other such equipment they have at their disposal, provided such equipment is in satisfactory condition and is of such design, type, size, weight, and quantity to obtain the required density in the embankment. If at any time the required density is not being obtained with the equipment then in use by the Contractor, the Engineer may require that different and/or additional compaction equipment be obtained and placed in use at once to obtain the required compaction.

F. The Contractor shall be responsible for the stability of all embankments and shall replace any portion which, in the opinion of the Engineer, has become displaced due to carelessness or negligence on the part of the Contractor.

3.8 TOPSOIL

A. Provide all labor, materials, equipment and services required for furnishing and placing topsoil. Samples of topsoil shall be submitted to the Engineer for review before topsoil is placed. The material shall be good quality loam and shall be fertile, friable, mellow; free from stones larger than 1 inch, excessive gravel, junk metal, glass, wood, plastic articles, roots and shall have a liberal amount of organic matter. Light sand loam or heavy clay loam will not be acceptable.

B. The topsoil shall be 3 inches thick in all areas to be seeded. No topsoil shall be placed until the area to be covered is excavated or filled to the required grade. Imported backfill material will be stockpiled on site for structure backfilling and top soiling.

END OF SECTION 312000

SECTION 312500 – EROSION AND SEDIMENTATION CONTROL (Areas Less Than One Acre)

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials, and equipment required for erecting, maintaining and removing temporary erosion and sedimentation controls as shown on the Drawings and as specified herein and as recommended by state and local regulatory agencies.

B. Temporary erosion controls include, but are not limited to grassing, mulching, seeding, providing erosion control and turf reinforcement mats on all disturbed surfaces including waste area surfaces and stockpile and borrow area surfaces; scheduling work to minimize erosion and providing interceptor ditches at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits.

C. Temporary sedimentation controls include, but are not limited to, silt dams, traps, barriers, and appurtenances on sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits.

D. Contractor is responsible for providing and maintaining effective temporary erosion and sediment control measures prior to and during construction or until final controls become effective.

E. The Contractor shall be responsible for placement of erosion and sedimentation controls. Prior to construction, the Contractor shall develop an erosion control plan and submit to the Engineer for review. Prior to excavation, fill or grade work, the Contractor shall place controls in locations required by the erosion control plan. If during the course of construction, the Engineer determines additional controls are required, the Contractor shall furnish, install and maintain additional mulching, blankets and/or sediment barriers to control erosion and sedimentation to the satisfaction of the Engineer.

F. The Contractor shall notify the appropriate state agency before beginning construction and shall implement erosion control measures as may be required by state and federal agencies. If disturbed area is greater than one acre, Contractor shall submit a signed Notice of Intent form to the Division of Water at least 48 hours prior to beginning of construction activity.

G. The Contractor shall inspect and repair all erosion and sedimentation controls every seven days and after each rainfall of 1/2 inch or greater.

H. Bare soil areas must be seeded, mulched, or covered after 14 days if no work will be done in the area within the next seven days.

1.2 RELATED WORK

A. Dewatering is included in this Division, Section 312319.

B. Final erosion protection measures where required are included in this Section.

C. Utility Line Stream Crossings - Division 02

PART 2 - PRODUCTS

2.1 SEED

A. The seed mixture to be sown shall be in the following proportions:

Common Name	Proportion By Weight	% of Purity	% of Germination
Line Lawn Fescue	40	90	85
Chewings Fescue	25	90	85
Italian Rye Grass	20	90	85
Red Top	10	90	85
White Clover	5	95	90

B. All seed shall be fresh and clean and shall be delivered mixed, in unopened packages, bearing a guaranteed analysis of the seed mixture.

2.2 FERTILIZER

A. Just prior to the planting of turf, evenly broadcast 15 pounds per thousand square feet of fertilizer, 10-10-10 (nitrogen, phosphorus, potassium). Disc or harrow fertilizer 2 to 4 inches into the soil.

B. Fertilizer shall be delivered to the site in the original unopened container bearing the manufacturer's guarantee analysis. Any fertilizer that becomes caked or damaged making it unsuitable for use, will not be accepted.

2.3 SOD

A. Sod shall be at least 70 percent Bluegrass, strongly rooted and free of weeds.

B. It shall be mowed to a height not to exceed 3 inches before lifting and shall be of uniform thickness with not over 1-1/2 inches of soil.

2.4 MULCH

A. Mulch for seeded areas shall be Conwed Hydro Mulch, Silva-Fiber, or equal. It shall be suitable for use in a water slurry or for application with hydraulic equipment.

B. Clean straw is acceptable as mulch. It shall be spread at the rate of one bale per 1,000 feet (approximately 2 inches loose depth).

C. Mulch on slopes at or greater than 3:1 shall be held in place with turf reinforcement mat.

D. Mulch on areas subject to surface water run-off or in drainage ditches shall be held in place with turf reinforcement mat.

2.5 EROSION CONTROL BLANKETS

A. Erosion Control Blanket shall be made up of biodegradable and/or photodegradable products such as jute, wood fiber, coconut fiber, straw and degradable plastic netting. They shall degrade at a rate of approximately 6 months to 24 months.

B. Erosion Control Blanket shall be installed on slopes less than 3:1.

2.6 TURF REINFORCEMENT MAT

A. Where indicated on the Contract Drawings or as described in the Specifications, in all ditches and drainage channels and on all slopes equal to or greater than 3:1, Turf Reinforcement Mat shall be installed for long-term erosion control.

B. Turf Reinforcement Mat shall consist of top- and bottom-heavy weight netting and biodegradable matrix such as coconut fiber or aspen curled wood excelsior, as manufactured by Western Excelsior Excel PP5-8 Turf Reinforcement Mat or equal. Product shall degrade at a minimum rate of 36 months.

C. Where slope and hydraulic conditions are severe, a synthetic matrix may be used, based on manufacturer's recommendations.

2.7 SILT FENCE

A. Temporary Silt Fence shall consist of woven geotextile fabric attached to 2-inch x 2-inch x 48-inch-tall hardwood stakes.

1. Exposed Fabric shall be 36 inches, and a minimum of 4 inches shall be buried in trench as shown on the Detail Drawings.
2. Stakes shall be at 6 feet centers unless stated otherwise on Contract Documents.

B. Temporary Reinforced Silt Fence

1. For areas of steep slopes and high flows, where indicated on the Contract Drawings, or as directed by state or local regulations, Reinforced Silt Fence shall be installed.
2. Fabric shall be woven monofilament geotextile attached to 11 gauge steel fencing of 2-inch x 4-inch grid.
3. Stakes shall be 5 feet tall steel and shall be installed on 4 foot centers.
4. Fabric and fencing shall be buried in trench as shown on the Detail Drawings.

C. Spacing of Silt Fences on slopes shall be according to the following table, or as directed by state or local regulatory agencies:

Slope Angle		Soil Type		
		Silty	Clays	Sandy
Very Steep	(1:1)	50 feet	75 feet	100 feet
Steep	(2:1)	75 feet	100 feet	125 feet
Moderate	(4:1)	100 feet	125 feet	150 feet
Slight	(10:1)	125 feet	150 feet	200 feet

D. If runoff flows along the uphill side of the silt fence, Contractor shall install "J-hooks" every 40 feet to 80 feet. These are curved sections of silt fence above the continuous fence that serve as small dams to stop and hold the flow to allow sediment to settle.

2.8 FIBER ROLLS

A. On long slopes less than 10:1 and where indicated on the Contract Drawings or recommended by the regulatory agency, Fiber Rolls shall be installed.

B. Fiber Rolls shall be made of wood shavings, coconut fiber or other similar material encased in heavy duty netting.

C. Wooden stakes at 4 feet o.c. shall be used to anchor the Fiber Rolls along the contours of the slope.

2.9 AGGREGATE SILT CHECKS

A. Where needed to slow flow velocity, to cause ponding or to protect storm water inlet structures, Aggregate Silt Checks shall be installed.

B. Aggregate Silt Checks shall consist of rock of various sizes ranging from 2 inches to 6 inches contained in or placed on geotextile filter fabric. Pea-stone or gravel-filled bags are acceptable for temporary silt checks in low-flow conditions.

2.10 RIP RAP

A. Rip Rap shall be installed at the outlets of storm drains and on channel banks as noted on the Contract Drawings and/or recommended by state and local regulatory agencies.

B. Rip Rap shall have no less than 80 percent, by volume, of individual stones that range in size from 0.0247 to 1.483 cf.

2.11 CONSTRUCTION ENTRANCE PAD

A. Contractor shall construct entrance pads at all locations where vehicles will enter or exit the site.

B. Pad shall be a minimum of 20 feet wide, 50 feet long and 6 inches thick, and consist of No. 2 stone laid on top of filter fabric.

PART 3 - EXECUTION

3.1 GENERAL

A. Erosion and sediment control practices shall be consistent with the requirements of the state and local regulatory agencies and in any case shall be adequate to prevent erosion of disturbed and/or regraded areas.

B. Contractor is responsible for notifying the state regulatory agency concerning inclusion under the NPDES General Permit for Storm Water Discharges From Construction Activities.

C. Gravity sewer lines and force mains that cross steams shall be constructed by methods that maintain normal stream flow and allow for a dry exaction. Water pumped from the excavation shall be contained and allowed to settle prior to reentering the stream. Excavation equipment and vehicles shall operate outside of the flowing portion of the stream. Spoil material from the sewer line excavation shall not be allowed to enter the flowing portion of the stream. The provisions of this condition shall apply to all types of utility line stream crossings.

D. Removal of riparian vegetation in the utility line right-of-way shall be limited to that necessary for equipment access. Effective erosion and sedimentation control measures must be employed at all times during the project to prevent degradation of waters of the Commonwealth. Site regrading and reseeding will be accomplished with 14 days after disturbance.

3.2 SEEDING

A. The areas to be seeded shall be thoroughly tilled to a depth of at least 4 inches by discing, harrowing, or other approved methods until the condition of the soil is acceptable to the Engineer. After harrowing or discing, the seed bed shall be dragged and/or hand raked to finish grade.

B. The incorporation of the fertilizer and the agricultural lime may be a part of the tillage operation and shall be applied no less than 24 hours nor more than 48 hours before the seed is to be sown.

C. Seed shall be broadcast either by hand or approved sowing equipment at the rate of 90 lbs. per acre (2 lbs. per 1,000 sf), uniformly distributed over the area. Broadcasting seeding during high winds will not be permitted. The seed shall be drilled or raked into a depth of approximately 2 inches and the seeded areas shall be lightly raked to cover the seed and rolled. Drilling seeding shall be done with approved equipment with drills not more than 3 inches apart. All ridges shall be smoothed out, and all furrows and wheel tracks likely to develop into washes, shall be removed.

D. After the seed has been sown, the areas so seeded shall be mulched with clean straw at the rate of one bale per 1,000 feet (approximately 2-inch loose depth). Mulch on slopes and in all ditches and drainage channels shall be held in place with erosion control blankets.

E. Areas seeded shall be watered and protected until a uniform stand develops, and then inspected periodically and maintained appropriately. Displaced mulch shall be replaced or any damage to the seeded area shall be repaired promptly, both in a manner to cause minimum disturbance to the existing stand of grass. If necessary to obtain a uniform stand, the Contractor shall

refertilize, reseed and remulch as needed. Scattered bare spots up to 1 square yard in size will be allowed up to a maximum of 10 percent of any area.

F. Payment for seeding and mulching shall be included in the Contractor's bid.

3.3 SOD

A. To install, bring soil to final grade and clear of trash, wood, rock, and other debris. Apply topsoil, fertilizer at approximately 1000 lbs per acre.

B. Use sod within 36 hours of cutting. Lay sod in straight lines. Butt joints tightly, but do not overlap joints or stretch sod. Stagger joints in adjacent rows in a brickwork type pattern. Use torn or uneven pieces on the end of the row.

C. Notch into existing grass. Anchor sod with pins or stakes if placed on slopes greater than 3:1. Roll or tamp sod after installation and water immediately. Soak to a depth of 4 inches to 6 inches. Replace sod that grows poorly. Do not cut or lay sod in extremely wet or cold weather. Do not mow regularly until sod is well established.

3.4 INSTALLATION OF EROSION AND SEDIMENT CONTROL DEVICES

A. All erosion and sediment control products and materials shall be installed per manufacturer's recommendations and in accordance with the Kentucky Erosion Prevention and Sediment Control Field Guide.

B. Contractor shall pay special attention to the trenching-in of the bottoms of silt fence, the staking of sediment barriers, and the stapling of erosion control blankets.

3.5 MAINTENANCE OF EROSION AND SEDIMENT CONTROL DEVICES

A. Erosion and sedimentation controls shall be inspected weekly and after rain events of 1/2-inch or greater. Replace silt fencing as needed, filter stone which is dislodged, erosion control blanket which is damaged, and make other necessary repairs.

B. Remove sediment from fences and barriers when it accumulates to half the height of the barrier, or more often as needed.

3.6 CLEAN UP

A. Upon completion of the project and/or establishment of satisfactory turf, vegetation or permanent erosion control structures, Contractor shall remove all temporary devices and properly dispose of such.

END OF SECTION 312500

SECTION 315000 – EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. This Section includes, but is not limited to, the following:

1. Shoring and bracing necessary to protect existing buildings, streets, walkways, utilities, and other improvements and excavation against loss of ground or caving embankments.
2. Maintenance of shoring and bracing.
3. Removal of shoring and bracing, as required.

B. Types of shoring and bracing systems include, but are not limited to, the following:

1. Steel H-section (soldier) piles.
2. Timber lagging.
3. Steel sheet piles.
4. Portable Steel Trench Box.

C. Building excavation is specified in another Section.

1.2 RELATED DOCUMENTS

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

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Section 013323.

Layout drawings for excavation support system and other data prepared by, or under the supervision of, a qualified Professional Engineer. System design and calculations must be acceptable to local authorities having jurisdiction. This submittal is for information only. Engineer's review is not for adequacy design, but to verify that it has been designed by a licensed professional. Design of shoring is part of means and methods of construction and remains solely the responsibility of the Contractor.

1.4 QUALITY ASSURANCE

A. Engineer Qualifications: A Professional Engineer legally authorized to practice in jurisdiction where Project is located and experienced in providing successful engineering services for excavation support systems similar in extent required for this Project.

B. Supervision: Engage and assign supervision of excavation support system to a qualified Professional Engineer foundation consultant.

C. Regulations: Comply with codes and ordinances of governing authorities having jurisdiction.

1.5 JOB CONDITIONS

A. Before starting work, verify governing dimensions and elevations. Verify condition of adjoining properties. Take photographs to record any existing settlement or cracking of structures, pavements, and other improvements. Prepare a list of such damages, verified by dated photographs, and signed by Contractor and others conducting investigation.

B. Survey adjacent structures and improvements, employing qualified Professional Engineer, establishing exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

C. During excavation, resurvey benchmarks weekly, maintaining accurate log of surveyed elevations for comparison with original elevations. Promptly notify Engineer if changes in elevations occur or if cracks, sags, or other damage is evident.

1.6 EXISTING UTILITIES

A. Protect existing active sewer, water, gas, electricity and other utility services and structures.

B. Notify municipal agencies and service utility companies having jurisdiction. Comply with requirements of governing authorities and agencies for protection, relocation, removal, and discontinuing of services.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide adequate shoring and bracing materials which will support loads imposed. Materials need not be new but should be in serviceable condition.

B. Structural Steel: ASTM A 36.

C. Steel Sheet Piles: ASTM A 328.

D. Timber Lagging: Any species, rough-cut, mixed hardwood, nominal 3 inches thick, unless otherwise indicated.

E. Portable Steel Trench Box shall be OSHA approved.

PART 3 - EXECUTION

3.1 SHORING

A. Wherever shoring is required, locate the system to clear permanent construction and to permit forming and finishing of concrete surfaces. Provide shoring system adequately anchored and braced to resist earth and hydrostatic pressures.

B. Shoring systems retaining earth on which the support or stability of existing structures is dependent must be left in place at completion of work.

3.2 BRACING

A. Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move a brace, install new bracing prior to removal of original brace.

B. Do not place bracing where it will be cast into or included in permanent concrete work, except as otherwise acceptable to Engineer.

C. Install internal bracing, if required, to prevent spreading or distortion of braced frames.

D. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

E. Remove sheeting, shoring, and bracing in stages to avoid disturbance to underlying soils and damage to structures, pavements, facilities, and utilities.

F. Repair or replace, as acceptable to Engineer, adjacent work damaged or displaced through installation or removal of shoring and bracing work.

END OF SECTION 315000

DIVISION 33

UTILITIES

SECTION 330523 – STEEL CASING PIPE

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment and services required to furnish and install all bored and jacked and open cut carrier pipes in encasement pipes under railroad and highway crossings as shown on the Drawings and/or specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork Section 312000

B. Piping: Division 33

1.3 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.

B. At the time of submission, the Contractor shall, in writing, call the Engineer's attention to any deviations that the submittals may have from the requirements of the Contract Drawings and Specifications.

C. Comply with all requirements of Section 013323.

D. In accordance with the requirements of the General and Special Conditions and this Section, the following table includes, but is not limited to, the items required to be submitted:

Item Description	Shop Drawings	Product Data	Schedules	Installation Data	Parts Lists	Wiring Diagram	Samples	O & M Manual	Certificates	Warranty	Report	Other
Carrier Pipe		X							X			
Casing Pipe		X										
Casing Spacers		X		X								
Casing End Seals		X		X								

1.4 EXISTING CONDITIONS

A. The existing piping & other utilities shown on the Contract Drawings is based on the best available information. The Engineer makes no guarantee as to the accuracy of the locations or type of piping or utility depicted. All new piping which ties into existing lines must be made compatible with that piping.

B. So that piping conflicts may be avoided, Contractor shall locate the utility (vertically & horizontally) well ahead of the pipe laying operation to confirm exact locations of existing piping before installing any new piping.

C. Contractor shall provide all fittings and adapters necessary to complete all connections to existing piping.

PART 2 - PRODUCTS

2.1 CARRIER PIPE

A. Carrier pipe shall be as specified in the applicable Division 33 section unless otherwise noted.

B. The pipe push-on joints shall be restrained by use of a rubber gasket that has stainless steel wedging segments spaced around the gasket. Restrained push-on joint rubber gasket shall be Fast-Grip by American Ductile Iron Pipe, Field Lok 350 Gasket by US Pipe, or Engineer-approved equal.

2.2 CASING PIPE

A. Casing pipe shall be steel, plain end, have a minimum yield point strength of 35,000 psi and conform to ASTM A 252 Grade 2 or ASTM A 139 Grade B without hydrostatic tests. The steel pipe shall have welded joints and be in at least 18-foot lengths.

B. The diameter of the casing pipe shall be as follows:

Carrier Pipe Nominal Diameter (Inches)															
4	6	8	10	12	14	15	16	18	20	21	24	27	30	33	36
Casing Pipe Nominal Diameter (Inches)															
10	12	16	18	20	24	24	30	30	30	36	36	42	48	50	50

For carrier pipe sizes greater than 36 inches nominal diameter, the casing pipe diameter size shall be determined by the Engineer or as shown on the Contract Drawings.

C. The wall thickness of the casing pipe shall be as follows:

Casing Pipe Nominal Diameter (Inches)								
Under 20	20 & 22	24	30	36	38	42	48	50
Casing Pipe Nominal Thickness (Inches) - Under Paved Roads Under CSX Right of Way if Coated or Cathodically Protected								
.250 (1/4")	.281 (9/32")	.312 (5/16")	.406 (13/32")	.469 (15/32")	.500 (1/2")	.562 (9/16")	.625 (10/16")	.656 (21/32")
Casing Pipe Nominal Thickness (Inches) - Under CSX Right of Way Uncoated and Cathodically Unprotected								
.312 (5/16")	.344 (11/32")	.375 (3/8")	.469 (15/32")	.532 (17/32")	.562 (9/16")	.625 (5/8")	.688 (11/16")	.719 (23/32")

However, should casing pipe thickness be specified or required on Highway or Railroad permit approval sheets, said permit thickness requirement shall govern. Permit approval sheets will be made available to the Contractor.

2.3 CASING SPACERS

A. Stainless Steel Casing Spacers: Stainless steel casing spacers shall be bolt-on style with a shell made in two sections of heavy T-304 stainless steel. Connecting flanges shall be ribbed for extra strength. The shell shall be lined with a PVC liner .090 inches thick with 85-90 durometer. All nuts and bolts are to be 18-8 stainless steel. Runners shall be made of ultra high molecular weight polymer with inherent high abrasion resistance and a low coefficient of friction. Runners shall be supported by risers made of heavy T-304 stainless steel. The supports shall be mig welded to the shell and all welds shall be fully passivated. Stainless steel casing spacers shall be made by Cascade Waterworks Mfg. Co., or equal.

2.4 CASING END SEALS

A. The annual space between the steel casing pipe and the carrier pipe shall be sealed by use of interlocking link pipe seals. Seals shall be modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall sleeve. Links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with pressure plate under each bolt head and nut. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide an absolutely water-tight seal between the pipe and wall sleeve. Bolts and hardware shall be constructed of 316 stainless steel. Seals shall be "Link-Seal Model S-316 Modular Seal" as manufactured by PSI-Thunderline/Link-Seal, Houston, TX, or approved equal.

B. The Contractor shall determine the required diameter of each casing/carrier pipe installation according to the manufacturer's recommendations before ordering and installing the seal, Carrier pipe shall be accurately centered in the casing pipe and link seals shall be sized,

installed and tightened in accordance with the manufacturer's instructions or per method approved by the Engineer.

PART 3 - EXECUTION

3.1 CROSSINGS - GENERAL

A. Where designated on the drawings, crossings beneath state maintained roads, not to be disturbed shall be accomplished by boring and jacking a casing pipe.

B. Steel casing pipe for crossings shall be bored and/or jacked (or open cut installed where indicated on the Drawings) into place to the elevations shown on the drawings. All joints between lengths shall be solidly butt-welded with a smooth non-obstructing joint inside. The casing pipe shall be installed without bends. The carrier pipe shall be installed after the casing pipe is in place, and shall extend a minimum of 2 feet beyond each end of the casing to facilitate making joint connections. The carrier shall be braced and centered with casing spacers within the casing pipe to preclude possible flotation. Casing spacers shall be installed a maximum of 8 feet apart along the length of the carrier pipe within the casing pipe, within 2 feet of each side of a pipe joint, and the rest evenly spaced. The height of the supports and runners combined shall be sufficient to keep the carrier pipe at least 3/4 inches from the casing pipe wall at all times. Manufacturer's recommendations may govern these requirements.

C. At each end of the casing pipe, the carrier pipe shall be sealed with casing end seals. The end seals shall extend a minimum of 12 inches in each direction from the end of the casing pipe.

D. Wood skids are not an acceptable method of supporting the carrier pipe.

3.2 CROSSING - RAILROAD

A. All water or sewer line crossings of railroads shall be prominently marked at railroad right-of-way lines, on both sides of the track crossing, by durable, weatherproof signs located over the center of the water line. When possible, signs shall be located so that when standing at one sign, the other marker is visible. Signs shall show the following:

1. Name and address of Owner.
2. Contents of pipe.
3. Pressure in pipe.
4. Pipe depth below grade at point of sign.
5. Emergency telephone number in event of pipe rupture.

B. Contractor must adhere to all safety requirements of the Railway line involved in the crossing.

1. All operations shall be conducted so as to not interfere with, interrupt, or endanger the operation of trains nor damage, destroy, or endanger the integrity of railroad facilities. The Contractor shall provide written acknowledgment to the Railway line that the Contractor and its employees have received, read, and understood the safety rules. Operations will be subject to inspection at any and all time.

2. All cranes, lifts, or other equipment that will be operated in the vicinity of the railroad's electrification and power transmission facilities shall be electrically grounded in an approved manner.
3. At all times, while work is in progress, a field supervisor with no less than 12 months experience in the operation of the equipment being used shall be present. If boring equipment or similar machines are being used, the machine operator shall also have a minimum of 12 months experience in the operation of the equipment being used.
4. Whenever equipment or personnel are working closer than 15 feet from the centerline of an adjacent track, that track shall be considered as being obstructed. Operations closer than 15 feet from the centerline of the track shall be conducted only with the permission of, and as directed by, a duly qualified railroad employee present at the site of the work.
5. Crossing the tracks at grade by equipment and personnel is prohibited except by prior arrangement with, and as directed by, the railroad line. A separate permit must be obtained, by the Contractor, for any "at grade" crossing of the tracks.

C. All railroad costs incurred by the Railway line due to work associated with the crossing (inspection, flagging, track work, etc.) shall be paid by the Owner. However, it is the Contractor's responsibility to coordinate the work with the Railway.

D. Contractor shall notify the Railway line's area engineer a minimum of 14 working days prior to desired start of construction.

3.3 BORING AND JACKING

A. The Contractor shall excavate his own pits, as he may deem necessary, and will set his own line and grade stakes which shall be checked by the Engineer. Permits, as required, will be furnished or obtained by the Owner, but shall be in the Contractor's hands before any excavating is commenced.

B. The boring method shall consist of pushing the pipe into the earth with a boring auger rotating within the pipe to remove the spoil.

1. The front of the pipe shall be provided with mechanical arrangements or devices that will positively prevent the auger from leading the pipe so that there will be no unsupported excavation ahead of the pipe.
2. The auger and cutting head arrangement shall be removable from within the pipe in the event an obstruction is encountered. If the obstruction cannot be removed without excavation in advance of the pipe, the pipe shall be abandoned in place and immediately filled with grout.
3. The over-cut by the cutting head shall not exceed the outside diameter of the pipe by more than 2 inches. If voids should develop or if the bored hole diameter is greater than the outside diameter of the pipe by more than approximately 1 inch, grouting or other approved methods must be used to fill such voids.
4. The face of the cutting head shall be arranged to provide a reasonable obstruction to the free flow of soft or poor material.
5. Any method which does not have this boring arrangement will not be permitted. Contractor's boring arrangement plans and methods must be submitted to, and approved by, the Engineer.

C. In the event an obstruction is encountered in boring which cannot be removed, and it becomes necessary to withdraw the casing and commence elsewhere, the hole from which the casing is withdrawn shall be completely backfilled with coarse sand rammed in.

D. Insurance to be furnished by the Contractor to cover this type of work shall be adequate to meet the requirements of the Railroad and/or State or County Highway Departments. Insurance shall consist of comprehensive general liability and automobile liability insurance.

E. Before award of the contract, the Contractor shall furnish a statement of his experience of such work, or if inexperienced, shall advise the Owner as to whom he will sublet the work and give a statement of the experience of the subcontractor, which shall be satisfactory to the Owner.

3.4 CONTRACTOR'S RESPONSIBILITIES

A. Obtain a copy of the Highway Encroachment and/or Railroad Permit before beginning construction.

B. Attend a preconstruction meeting at the construction site with the City Inspector, Railroad Inspector, Highway Inspector Engineer, and Contractor being present.

END OF SECTION 330523

SECTION 330524 – HORIZONTAL DIRECTIONAL DRILLING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment and services required to utilize the trenchless technology of horizontal directional drilling (HDD) for the installation of below grade piping and appurtenances as specified herein. Where open cut excavation is required, refer to Specification Section 331113. Work shall include, but not be limited to, proper installation, testing, and restoration of the site and damaged underground utilities. Installation procedures shall be in accordance with the approved North American Society for Trenchless Technology (NASTT) "HDD Good Practices Guideline".

B. The HDD piping shall be is HDPE DR11, AWWA C900 pipe. The HDPE shall be DRISCOPLEX PE 4710 HDPE (DR11) pipe as manufactured by Chevron Philips Chemical Company, Inc. (formerly Philips Product Company), JM Eagle PE 4710 HDPE Water/Sewer (DR11) pipe as manufactured by J-M Manufacturing Company, Inc., ISCO PE 4710 HDPE (DR11) pipe as manufactured by ISCO Industries, LLC, or Engineer approved equal.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this Section.

B. Piping is specified in Division 33 Specification sections.

1.3 EXISTING CONDITIONS

A. The existing piping and other utilities shown on the Contract Drawings is based on the best available information. The Engineer makes no guarantee as to the accuracy of the locations or type of piping or utility depicted. All new piping which ties into existing lines must be made compatible with that piping.

B. So that piping conflicts may be avoided, Contractor shall locate the utility (vertically and horizontally) well ahead of the pipe laying operation to confirm exact locations of existing piping before installing any new piping.

C. Contractor shall provide all fittings and adapters necessary to complete all connections to existing piping.

1.4 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 013323.

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.

C. Work Plan - Prior to beginning work, the Contractor must submit to the Engineer an HDD Work Plan outlining the procedure and schedule to be used to execute the project. Work Plan should be realistic and document the thoughtful planning required to successfully complete the project, based on the actual working conditions anticipated for this project. The HDD Work Plan should include a description of:

1. All equipment to be used including drill rigs, down-hole tools, drilling heads, electronic guidance system, and fusing or coupling equipment.
2. Drilling materials and mud system, including drilling additives and drilling fluid mixtures.
3. A list of personnel and their qualifications and experience (including backup personnel in the event an individual is unavailable).
4. A list of subcontractors and identification of subcontractor work tasks.
5. A schedule of work activity including detailing work crews, scheduling of pull-ins, material deliveries and other required work tasks.
6. A safety plan (including MSDS of any potentially hazardous substances to be used).
7. An environmental protection plan.
8. The location of the drill rig setups at the entry and exit points.
9. Groundwater control and dewatering procedures.
10. Calculations showing the anticipated pull-in forces for each section to be installed, and verification that the pull-in forces and critical buckling forces are acceptable for the pipe material specified.
11. Material lay-down area plans.
12. Drilling mud disposal plan.
13. Contingency plans for possible problems including overstressing pipe during pull-in, pipe/coupling failure or damage during pull-in, unanticipated obstructions during drilling, pilot hole collapse, drilling mud blowouts, surface settlement and/or surface heaving, and drilling rig breakdowns.
14. The methodology to be used to connect pipe sections which are directionally drilled. The methodology shall include, at a minimum, discussions of:

    a. How, when and where the pipes will be fused (on grade).
    b. How the bore hole will be developed and how horizontal and vertical alignment control of the bore will be maintained.
    c. How the pipe will be installed in the bore hole.
    d. How any buried utility conflicts (if any) over the top of the bored pipe will be dealt with.

15. A plan for dealing with thermal expansion and contraction during and after construction. The anticipated operating range of the pipe and water within the pipe will be from 32 degrees F to 70 degrees F. The plan should include calculations showing the maximum expansion and contraction and a listing of anchors and restraints intended to be used and where they will to be installed.
16. A plan for disposal of excess excavated material and groundwater collected during drilling. Disposal methods shall comply with local, County, State and Federal requirements.

D. Equipment - The Contractor shall submit specifications on directional drilling equipment to be used to ensure that the equipment will be adequate to complete the project including but not limited to the following: drilling rig and drilling rods, drilling head and back-reamers, drilling materials and additive fluids, mud system (including mud motors and recovery systems, if applicable), downhole tools, electronic guidance system, pipe fusion or joining systems, and rig safety systems. Calibration records for guidance systems shall be included indicating that calibration has been performed within 6 months of start of drilling.

1.5 QUALITY ASSURANCE

A. The requirements set forth in this document specify a wide range of procedural precautions necessary to ensure that the very basic, essential aspects of a proper directional bore installation are adequately controlled. Strict adherence shall be required under specifically covered conditions outlined in this specification. Adherence to the specifications contained herein, or the Engineer's approval of any aspect of any directional bore operation covered by this specification, shall in no way relieve the Contractor of their ultimate responsibility for the satisfactory completion of the work authorized under the Contract.

B. Use of horizontal directional drilling for installation piping specified in Division 33 hereinafter shall be in Division 33 hereinafter accordance with the latest revision of ASTM F-1962.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pullback the pipe, a mixing and delivery system for drilling fluid of sufficient capacity to successfully complete the installation, a guidance system to accurately guide boring operations, control and containment of drilling fluid, along with trained and competent personnel to operate the system. All equipment shall be in good, safe operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of the project.

2.2 DRILLING SYSTEM

A. Drilling Rig - The directional drilling machine shall consist of a hydraulically powered system to rotate, push and pull hollow drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The machine shall be anchored to the ground to withstand the pulling, pushing and rotating pressure required to complete the installation. The hydraulic power system shall be self-contained with sufficient pressure and volume to power drilling operations. Hydraulic system shall be free of leaks. Rig shall have a system to monitor and record maximum pull-back pressure during pull-back operations. There shall be a system to detect electrical current from the drill string and have an audible alarm that automatically sounds when an electrical current is detected.

B. Drill Head - The drill head shall be steerable by changing its rotation and shall provide the necessary cutting surfaces and drilling fluid jets.

C. Mud Motors (if required) - Mud motors shall be of adequate power to turn the required drilling tools.

D. The drilling equipment shall be capable of providing continuous support to the drilled void through the application of pressure to the drilling fluid and the selection of appropriate drilling fluids to "bind" the soil.

2.3 GUIDANCE SYSTEM

A. The Contractor shall supply all components and materials to install, operate, and maintain the guidance system.

B. The entry angle for all HDD operations shall be 12 degrees from horizontal (0.21255 ft/ft).

C. A Magnetometer-accelerometer type Guidance System (MGS) probe or proven (non-experimental) gyroscopic probe and interface shall be used to provide a continuous and accurate determination of the location of the drill head during the drilling operation. The guidance system shall enable the driller to continuously guide the drill head by providing immediate information at the tool face, azimuth (horizontal) and inclination (vertical) directions. The guidance system shall be accurate and calibrated to manufacturer's specifications. The vertical location of the tool referenced to USGS elevations shall be capable of being continuously determined. The Contractor shall include the cost of additional survey and guidance systems necessary to achieve specified accuracy.

D. The MGS and wire line tracking system shall be set up and operated by personnel trained and experienced with the system. The Contractor shall be aware of any geo-magnetic anomalies and shall consider such influences in the operation if using a magnetic guidance system.

E. The accuracy of the bore path and resulting pipe profile centerline shall be within 4 feet left or right horizontally of the specified water main alignment and within 2 percent above or below the specified water main profile in any soil or rock condition. The exit point for the bore path and HDD water main shall be within a tolerance of 5 feet short of or 10 feet past the specified exit point.

F. The Contractor shall provide the Engineer with real-time readings from the wire line tracking system to verify the bore path is within the specified accuracy limits prior to pipe pull-back. Real-time readings will be read by the Contractor and Engineer from the tracking system during installation.

2.4 DRILLING FLUID (MUD) SYSTEM

A. Mixing System - A self-contained, closed, drilling fluid mixing system shall be of sufficient size to mix and deliver drilling fluid composed of bentonite clay, potable water and appropriate additives. Mixing system shall be able to molecularly shear individual bentonite particles from the dry powder to avoid clumping and ensure thorough mixing. The drilling fluid reservoir tank shall be sized for adequate storage of the mud mixture. Mixing system shall continually agitate the drilling fluid during drilling operations.

B. Drilling Fluids - Drilling fluid shall be composed of clean water and bentonite clay, utilized as required for the drilling conditions encountered. Water shall be from a clean source with a pH of 8.5 - 10 and/or as per mixing requirements of the manufacturer. Water of a lower pH or with excessive calcium shall be treated by the Contractor with the appropriate amount of sodium carbonate or equal at no additional cost. The water and additives shall be mixed thoroughly and be absent of any clumps or clods. Drilling fluid shall be maintained at a viscosity sufficient to suspend cuttings and maintain the integrity of bore wall. Additives shall be utilized as required for the drilling conditions encountered. No hazardous additives may be used.

C. Delivery System - The mud pumping system shall have a minimum capacity to supply mud in accordance with the drilling equipment pull-back rating at a constant required pressure. The delivery system shall have filters in-line to prevent solids from being pumped into the drill pipe. Connections between the pump and drill pipe shall be relatively leak-free. Used drilling fluid and drilling fluid spilled during drilling operations shall be contained and properly disposed of. A spill protection berm, minimum of 12 inches high and large enough to contain spills up to 1000 gallons, shall be maintained around drill rigs, drilling fluid mixing system, entry and exit pits, and drilling fluid recycling system (if used) to prevent spills into the surrounding environment. Pumps and or vacuum truck(s) of sufficient size shall be in place to convey excess drilling fluid from containment areas to storage, recycling, or disposal facilities.

2.5 OTHER EQUIPMENT

A. Pipe Rollers and Supports - Pipe rollers and supports shall be used for pipe assembly and during final pipe pull-back whenever the pipe lengths of 10 feet or more occur. Rollers and supports shall be capable of supporting the pipe materials uniformly and shall be equipped with rollers or other low friction systems which do not materially increase pull-back forces. Rollers and supports shall be designed and installed to prevent the pipe from falling off the sides or lifting due to sharp bends either vertically or horizontally. Systems shall be designed to account for pipe twisting/rotation during pull-back.

B. Pipe Rammers - Hydraulic or pneumatic pipe rammers may only be used if necessary and with the authorization of Engineer.

C. Restrictions - Other devices or utility placement systems for providing horizontal thrust other than those previously defined in the preceding sections shall not be used unless approved by the Engineer prior to commencement of the work. Consideration for approval will be made on an individual basis for each specified location. The proposed device or system will be evaluated prior to approval or rejection on its potential ability to complete the utility placement satisfactorily without undue stoppage and to maintain line and grade within the tolerances prescribed by the particular conditions of the project.

2.6 PERSONNEL REQUIREMENTS

A. All personnel shall be fully trained in their respective duties as part of the HDD crew and in safety. All drill rig and fluid mixing operators must have at least two years direction drilling experience with the equipment used for this project.

B. A competent and experienced Supervisor with a minimum of five years of experience in directional drilling shall be provided by the Contractor. The Supervisor shall be thoroughly

familiar with the equipment and type of the work to be performed and must be directly in charge and control of the operation at all times during the actual drilling operations.

C. The personnel operating the fusion equipment for HDPE pipe shall have at least five years of experience with fusion equipment and shall be certified by the pipe or fusion equipment manufacturer. Personnel who are unqualified, incompetent, or otherwise not suitable for the performance of this project shall be removed from the job site and replaced with suitable personnel.

2.7 COUPLINGS, FITTINGS AND PIPE JOINTS

A. All HDPE pipe and fittings shall be made of a high-density polyethylene pipe compound with extra high molecular weight that meets the requirements for Type III, Grade P34 polyethylene material as defined in ASTM D1248.

B. Pipes shall be joined to one another and to polyethylene fittings by thermal butt-fusion or by socket fusion in accordance with ASTM D3261. The tensile strength at yield of the butt-fusion joints shall not be less than the pipe. A specimen of pipe cut across the butt-fused joint shall be tested in accordance with ASTM D638.

C. Joining of pipe sections shall be performed in accordance with the procedures recommended by the pipe manufacturer. Joints between pipe sections shall be smooth on the inside and thermal projection beads shall not be greater than 3/16-inch.

PART 3 -EXECUTION

3.1 PREPARATION

A. The Engineer must be notified 48 hours in advance of starting work. The Engineer's approval for beginning the installation shall in no way relieve the Contractor of the ultimate responsibility for the satisfactory completion of the work as authorized under the Contract. It shall be the responsibility of Engineer to provide inspection personnel at such times as appropriate.

B. The Contractor shall be fully responsible for all damages resulting from their failure to comply with all applicable state, federal and local regulations, and requirements of these specifications.

C. The Contractor shall provide all material, equipment, and facilities required for directional drilling. Proper alignment and elevation of the borehole shall be consistently maintained throughout the directional drilling operation.

D. The entire drill path shall be accurately surveyed by the Contractor with entry, exit, and connection stakes placed prior to commencement of drilling the intended entry, exit, and connection points. The drill path shall be surveyed by the Contractor for any surface geo-magnetic variations or anomalies.

E. If obstructions to the drilling operations are encountered, the Contractor is responsible for investigating and resolving obstructions within requirements of these specifications, permits obtained for this project, and appropriate authority's regulations.

F. The Contractor shall place filter sock between all drilling operations and any surface drainage paths, wetlands, waterways, or other similar areas. Additional environmental protection necessary to contain hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains, and other measures.

G. The Contractor shall provide adequate supplies of pipe, drilling fluids, drilling rods, water, pipe supports and rollers, and fuel to allow continuous operations to be maintained once operations begin. Problems resulting from failure of the Contractor to maintain continuous operations shall not be cause for additional compensation or time.

3.2 GENERAL

A. Location readings shall be recorded after advancement of each successive drill pipe (no more than 20-foot intervals) and the readings plotted on the field copy of the plan and profile drawings. Vertical alignment shall be shown based on true elevation as determined by survey and not referenced from the surface grade. Access to all recorded readings and plan and profile information shall be made available to the Engineer and the Owner at all times.

B. All drilling fluids and loose cuttings shall be contained in pits or holding tanks for recycling or disposal at the Contractor's option. No fluids shall be allowed to enter any unapproved areas or natural waterways. During and following completion of directional drilling operations, the drilling mud and cuttings shall be disposed of by the Contractor at an approved dumpsite.

C. The deflection radius of the installed pipeline shall not exceed 70 percent of the minimum allowable bend radius allowed by the pipe manufacturer.

D. The Contractor shall take precautions to ensure settlement or heaving of surface or underground structures above directional drilling operations will not occur. For grade sensitive features such as railroad tracks, levee crossings, and sewers, an existing conditions survey shall be performed to document existing conditions. The existing conditions survey shall include detailed topographical survey of all features which may be affected by the proposed work such as ground surface, pavement surface, railroad ties, ballast and tracks, signals, or other cast in place structures, manholes, sewers, overhead utility poles, and other surface or subsurface features within 10 feet horizontally of the proposed alignment. Evidence that voids are being created, subsidence is occurring, or puncture/damage to underground utilities is occurring will be sufficient cause to require remedial action without additional compensation.

E. Protect all existing utilities, site objects, and new work, which are to remain in service.

F. Reroute around or excavate and remove obstacles and debris blocking progress of drilling, including but not limited to, cobbles, boulders, timbers, construction debris, concrete spillage from previous construction, abandoned utilities discovered during installation, and unused piling or caissons. The Contractor shall properly cap, plug, or bulkhead abandoned utilities which are discovered.

3.3 DRILLING PROCEDURE

A. Site Preparation - Prior to any alterations to work-site, Contractor shall photograph or video tape entire work area, including entry and exit points. One copy shall be given to the Engineer and one copy to remain with Contractor for a period of one year following the completion of the project. Work site as indicated on drawings, within right-of-way, shall be graded or filled to provide a level working area. No alterations beyond what is required for operations are to be made. Contractor shall confine all activities to designated work areas.

B. Drill Path Survey - Entire drill path shall be accurately surveyed with entry and exit stakes placed in the appropriate locations within the areas indicated on drawings. If Contractor is using a magnetic guidance system, drill path will be surveyed for any surface geomagnetic variations or anomalies.

C. Environmental Protection - Contractor shall have in place silt fence between all drilling operations and any drainage, wetland, waterway or other area designated for such protection by contract documents, state, federal and local regulations. Additional environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. Contractor shall adhere to all applicable environmental regulations. Also, all erosion control facilities shall be in accordance with Specification Section 312500, hereinafter, and the standard detail drawing for erosion control included in the contract drawings.

D. Safety - Contractor shall adhere to all applicable state, federal and local safety regulations and all operations shall be conducted in a safe manner. Safety meetings shall be conducted at least weekly with a written record of attendance and topic submitted to Engineer.

3.4 PILOT HOLE INSTALLATION

A. The pilot hole shall be drilled on the bore path with no deviations at any point greater than the specified accuracy vertically and horizontally. The pilot hole on the bore path shall not deviate more than 2 percent of the depth or one foot horizontally over the length of the bore. If the pilot hole does deviate from the bore path more than specified, vertically or horizontally at any point, Contractor shall notify Engineer. Engineer may require Contractor to pull-back and re-drill from the location along the bore path before the deviation if design alterations are not possible. In the event of a drilling fluid fracture or blowout, inadvertent returns, or returns lost during pilot hole drilling operations, Contractor shall cease drilling and take immediate steps to resolve the problem. If Contractor is unable to resolve problem in existing pilot hole, redrilling may be required at no additional cost. Contractor shall discuss re-drilling options with Engineer and work shall proceed as agreed.

B. Upon completion of pilot hole phase of the operation, an initial set of "As-Built" Record Drawings in electronic format shall be submitted to the Engineer and Owner within 1 working day of pilot hole completion. These drawings shall include the pilot hole bore path plan and profile within 0.25 feet at 25-foot intervals, as well as locational survey reports as recorded during drilling operations.

C. Engineer and Owner will review pilot hole information and determine if the location and elevation of the pilot hole are suitably close to the designed alignment and will complete this review within 1 working day following receipt from Contractor. Should Contractor decide the

initiate the hole enlarging phase of the operation prior to approval of the pilot hole, Contractor shall bear all risk for incorporating alterations requested following review of the pilot hole information by Engineer or Owner.

3.5 PIPE INSTALLATION

A. Upon approval of the pilot hole alignment by the Engineer and Owner, the hole opening or enlarging phase of the installation shall begin. The bore hole diameter shall be increased to accommodate the pull-back operation of the required carrier pipe. The type of hole opener or back reamer to be utilized shall be determined by the Contractor based on the types of subsurface rock and soil conditions encountered during the pilot hole drilling operation. The Contractor shall select the proper reamer type with the final hole opening being a maximum of 1.5 times the largest outside diameter pipe system component to be installed in the bore hole.

B. The open bore hole shall be stabilized by means of bentonite drilling slurry pumped through the inside diameter of the drill rod and through openings in the reamer. The drilling slurry must be in a homogenous, flowable state serving as an agent to carry the loose cuttings to the surface through the annulus of the borehole. The volume of bentonite mud required for each pull-back shall be calculated based on soil/rock conditions, largest diameter of the pipe system component, capacity of the bentonite mud pump, and the speed of pull-back as recommended by the bentonite drilling mud manufacturer. The bentonite slurry shall be contained at the exit or entry site of the directional bore in pits or holding tanks. The slurry may be recycled at this time for reuse in the hole opening operation or shall be hauled by the Contractor to a disposal site approved by the Engineer or Owner.

C. The pipe sections shall be joined together according to the pipe manufacturer's specifications. Butt fused joints shall be true alignment and shall have uniform roll-back beads resulting from proper temperature and pressure. Joints shall be allowed adequate cooling time before removal of pressure. Joints shall be watertight and have strength equal to that of the adjoining pipe sections.

D. A pulling eye shall be attached to a pipe pulling head on the lead section of pipe which in turn shall be attached to a swivel on the end of the drilling pipe.

E. Tracer wire shall not be required for HDD portions of the water main.

F. The pipe shall be elevated to the approximate angle of entry and supported by means of rollers and supports, to allow for the "free stress" situation as the pipe is pulled into the exit hole toward the drill rig. The pull-back phase of the HDD operation shall be carried out in a continuous manner until the pipe reaches the original entry side of the bore. The annular space between the pipe and the bore hole shall be filled with the bentonite mud to support and stabilize the pipe. The Contractor shall use caution to ensure that the pressure of the bentonite mud does not distort or collapse the pipe.

G. The pipe shall be ballasted during pull-back by completely filling the inside diameter of the pipe with water.

3.6 JOINING TO ADJACENT PIPE SECTIONS

A. When adjacent sections of HDD pipe are to be connected to each other, the Contractor shall excavate a sufficiently large area so that the adjoining sections of pipe can be installed without sags or humps so there are no high points created.

B. Excess pipe lengths from drilling operations shall be cut off accurately to connect to adjoining sections with a single coupling or butt fuse.

C. Trenching and backfilling operations shall comply with Specification Section 331113.

3.7 PIPE HANDLING

A. Care shall be taken during transportation of the pipe such that it will not be cut, kinked, or otherwise damaged.

B. Ropes, fabric, or rubber protected slings and straps shall be used when handling pipes. Chains, cables, and hooks inserted into the pipe ends shall not be used. Two slings spread apart shall be used for lifting each length of pipe. Pipe and pipe fittings shall not be dropped onto the ground.

C. Pipes shall be stored in accordance with manufacturer's recommendations on level ground, free of sharp objects that could damage the pipe. Stacking pipe shall only occur when manufacturer's shipping system is utilized which will not cause deformation of the bottom layers of pipe under anticipated temperature conditions.

D. The handling of the assembled pipeline shall be in such a manner that the pipe is not damaged by dragging it over sharp or cutting objects. Slings for handling of the pipeline shall not be positioned at pipe joints. Sections of the pipe with cuts and gouges or excessive deformation shall be removed and replaced.

3.8 TESTING AND INSPECTION

A. Leakage inspection - Perform a preliminary leakage test after each HDD pipe has been fused together for its entire length. Each connected length shall be successfully tested prior to installation by air pressure to 5 psi. The test pressure shall be held for a minimum duration of 15 minutes. The Contractor shall expect and allow for some straightening of the pipe in the laydown area during pressure testing without damage occurring to the pipe.

B. The Contractor shall perform a secondary leakage test immediately after installing each entire HDD pipe into place. This test shall meet the requirements for leakage and deflection in accordance with Specification Section 331113.

C. The Contractor shall perform a final leakage test once all pipe sections have been connected to the pipe water mains prior to and following the HDD portion of the project. The Contractor shall repair all visible or detected leaks.

D. Hydrostatic testing of the HDD pipe shall be performed in accordance with Specification Section 331113.

3.9 SITE RESTORATION

A. Following HDD operations, the Contractor shall demobilize equipment and restore the work sites to their original conditions. All temporary fencing, berms, excess piping and other items used during the HDD operation shall be removed from the work sites.

B. All excavations shall be backfilled and compacted to not less than 95 percent of original density. All drilling mud shall be disposed of by the Contractor.

END OF SECTION 330524

SECTION 331113 – WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment and services required for furnishing and installing all piping and appurtenances specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Valves - Utility Services Section 331216

B. Horizontal Directional Drilling: Section 330524

1.3 SUBMITTALS

A. A notarized certification shall be furnished for all pipe and fittings that verifies compliance with all applicable specifications.

B. The requirement for this certification does not eliminate the need for shop drawings submittals in compliance with Section 013323.

C. In accordance with the requirements of the General and Special Conditions and this Section, the following table includes, but is not limited to, the items required to be submitted:

Item Description	Shop Drawings	Product Data	Schedules	Installation Data	Parts Lists	Wiring Diagram	Samples	O & M Manual	Certificates	Warranty	Report	Other
Pipe and Fittings		X							X			
Couplings and Adapters		X										
Detectable UG Tape		X		X								
Tracer Wire		X		X								
Trench Baffles		X		X								
PE Tubing		X										
Corp. Stops and Fittings		X		X								

1.4 EXISTING CONDITIONS

A. The existing piping shown on the Contract Drawings is based on the best available information. The Engineer makes no guarantee as to the accuracy of the locations or type of piping depicted. All new piping which ties into existing lines must be made compatible with that piping.

B. So that piping conflicts may be avoided, Contractor shall open up his trench well ahead of the pipe laying operation to confirm exact locations of existing piping before installing any new piping.

C. Contractor shall provide all fittings and adapters necessary to complete all connections to existing piping.

1.5 UTILITY LINE ACTIVITIES COVERED UNDER NATIONWIDE PERMIT # 12

A. All activities involving utility line construction covered under the US Army Corps of Engineers NATIONWIDE PERMIT # 12 shall meet the following conditions:

1. Utility Line Activities. Activities required for the construction, maintenance, repair, and removal of utility lines and associated facilities in waters of the United States, provided the activity does not result in the loss of greater than 1/2-acre of waters of the United States for each single and complete project. Utility lines: This NWP authorizes the construction, maintenance, or repair of utility lines, including outfall and intake structures, and the associated excavation, backfill, or bedding for the utility lines, in all waters of the United States, provided there is no change in pre-construction contours. This NWP also authorizes temporary structures, fills, and work necessary to conduct the utility line activity.
2. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials, and be placed in a manner, that will not be eroded by expected high flows. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The areas affected by temporary fills must be revegetated, as appropriate.
3. Notification: The permittee must submit a pre-construction notification to the US Army Corps district engineer prior to commencing the activity if any of the following criteria are met:

    a) The activity involves mechanized land clearing in a forested wetland for the utility line right-of-way;
    b) A section 10 permit is required;
    c) The utility line in waters of the United States, excluding overhead lines, exceeds 500 feet;
    d) The utility line is placed within a jurisdictional area (i.e., water of the United States), and it runs parallel to or along a stream bed that is within that jurisdictional area;
    e) Discharges that result in the loss of greater than 1/10-acre of waters of the United States;
    f) Permanent access roads are constructed above grade in waters of the United States for a distance of more than 500 feet; or

g) Permanent access roads are constructed in waters of the United States with impervious materials.

B. All activities involving utility line construction covered under KENTUCKY GENERAL CERTIFICATION of Nationwide Permit # 12 shall meet the following conditions:

The general Water Quality Certification applies to surface waters of the Commonwealth as defined in 401KAR10:001 Chapter 10, Section 1(80): Surface waters means those waters having well-defined banks and beds, either constantly or intermittently flowing, lakes and impounded waters; marshes and wetlands; and any subterranean waters flowing in well-defined channels and having a demonstrable hydrologic connection with the surface.

1. The activity will not occur within surface waters of the Commonwealth identified by the Kentucky Division of Water as Outstanding State or National Resource Water, Cold Water Aquatic Habitat, or Exceptional Waters.
2. The activity will not occur within surface waters of the Commonwealth identified as perpetually protected (e.g. deed restriction, conservation easement) mitigation sites.
3. This general water quality certification does not authorize the installation of utility lines in a linear manner within the stream channel or below the top of the stream bank.
4 For a single crossing, impacts from the construction and maintenance corridor in surface waters shall not exceed 50 feet of bank disturbance.
5. This general certification shall not apply to nationwide permits issued for individual crossings which are part of a larger utility line project where the total cumulative impacts from a single and complete linear project exceed ½ acre of wetlands or 300 linear feet of surface waters. Cumulative impacts include utility line crossings, permanent or temporary access roads, headwalls, associated bank stabilization areas, substations, pole or tower foundations, maintenance corridor, and staging areas.
6. Stream impacts under Conditions 4 and 5 of this certification are defined as the length of bank disturbed. For the utility line crossing and roads, only one bank length is used in calculation of the totals.
7 Stream impacts covered under this General Water Quality Certification and undertaken by those persons defined as an agricultural operation under the Agricultural Water Quality Act must be completed in compliance with the Kentucky Agricultural Water Quality Plan (KWQP).
8. The Kentucky Division of Water may require submission of a formal application for an individual certification for any project if the project has been determined to likely have a significant adverse effect upon water quality or degrade the waters of the Commonwealth so that existing uses of the water body or downstream waters are precluded.
9. Activities that do not meet the conditions of this General Water Quality Certification require an Individual Section 401 Water Quality Certification.
10. Blasting of stream channels, even under dry conditions, is not allowed under this general water quality certification.
11. Utility lines placed parallel to the stream shall be located at least 50 feet from an intermittent or perennial stream, measured from the top of the stream bank. The cabinet may allow construction within the 50-foot buffer if avoidance and minimization efforts are shown, and adequate methods are utilized to prevent soil from entering the stream.
12. Utility line stream crossings shall be constructed by methods that maintain flow and allow for a dry excavation. Water pumped from the excavation shall be contained and allowed to settle prior to re-entering the stream. Excavation equipment and vehicles shall operate outside of the flowing portion of the stream. Spoil material from the excavation shall not be allowed to enter the flowing portion of the stream.

13. The activities shall not result in any permanent changes in pre-construction elevation contours in surface waters or wetlands or stream dimension, pattern or profile.
14. Utility line activities which impact wetlands shall not result in conversion of the area to non-wetland status. Mechanized land clearing of forested wetlands for the installation or maintenance of utility lines is not authorized under this certification.
15. Activities qualifying for coverage under this General Water Quality Certification are subject to the following conditions:

    a. Erosion and sedimentation pollution control plans and Best Management Practices must be designed, installed, and maintained in effective operating condition at all times during construction activities so that violations of state water quality standards do not occur.
    b. Sediment and erosion control measures, such as check-dams constructed of any material, silt fencing, hay bales, etc., shall not be placed within surface waters of the Commonwealth, either temporarily or permanently, without prior approval by the Kentucky Division of Water's Water Quality Certification Section. If placement of sediment and erosion control measures in surface waters is unavoidable, design and placement of temporary erosion control measures shall not be conducted in such a manner that may result in instability of streams that are adjacent to, upstream, or downstream of the structures. All sediment and erosion control devices shall be removed, and the natural grade restored within the completion timeline of the activities.
    c. Measures shall be taken to prevent or control spills of fuels, lubricants, or other toxic materials used in construction from entering the watercourse.
    d. Removal of riparian vegetation shall be limited to that necessary for equipment access.
    e. To the maximum extent practicable, all in-stream work under this certification shall be performed under low-flow conditions.
    f. Heavy equipment, e.g. bulldozers, backhoes, draglines, etc., if required for this project, should not be used or operated within the stream channel. In those instances in which such in-stream work is unavoidable, then it shall be performed in such a manner and duration as to minimize turbidity and disturbance to substrates and bank or riparian vegetation.
    g. Any fill shall be of such composition that it will not adversely affect the biological, chemical, or physical properties of the receiving waters and/or cause violations of water quality standards. If rip-rap is utilized, it should be of such weight and size that bank stress or slump conditions will not be created because of its placement.
    h. If there are water supply intakes located downstream that may be affected by increased turbidity and suspended solids, the permittee shall notify the operator when such work will be done.
    i. Should evidence of stream pollution or jurisdictional wetland impairment and/or violations of water quality standards occur as a result of this activity (either from a spill or other forms of water pollution), the Kentucky Division of Water shall be notified immediately by calling (800) 928-2380.

16. Non-compliance with the conditions of this general certification or violation of Kentucky state water quality standards may result in civil penalties.

1.6 CONSTRUCTION IN A FLOODPLAIN

A. No material shall be placed in the stream or in the flood plain to form construction pads, coffer dams, access roads, etc. unless prior approval has been obtained from the Environmental and Public Protection Cabinet.

B. The trench shall be backfilled as closely as possible to the original contour. All excess material from construction of the trench shall be disposed of outside the flood plain unless the applicant has received prior approval from the Cabinet to fill within the flood plain.

PART 2 - PRODUCTS

2.1 DUCTILE IRON PIPE AND FITTINGS

A. Ductile iron pipe shall conform to ANSI/AWWA C151/A21.51, latest revision, pressure class 350, with push-on joints unless otherwise noted on Drawings.

B. The interior of the pipe shall be cement-mortar lined with bituminous seal coat in accordance with ANSI/AWWA C104/A21.4, latest revision. Thickness of the lining shall be as set forth in the ANSI/AWWA C104/A21.4 specification unless otherwise directed by the Engineer. The exterior of all pipe, unless otherwise specified, shall receive either coal tar or asphalt base coating a minimum of 1 mil thick.

C. Each piece of pipe shall bear the manufacturer's name or trademark, the year in which it was produced and the letters "DI" or the word "DUCTILE". Pipe manufacturer shall furnish notarized certificate of compliance to the above AWWA or ANSI specifications.

D. Fittings shall be pressure class 350 ductile iron and have mechanical-joints or push-on joints in accordance with ANSI/AWWA C110/A21.10, latest revision and shall conform to the details and dimensions shown therein. Fittings shall have interior cement-mortar lining as specified hereinbefore for the pipe. Compact ductile iron fittings meeting the requirements of ANSI/AWWA C153/A21.53, latest revision, will also be acceptable.

E. Joints for ductile iron pipe and fittings, as described hereinbefore, shall be rubber-gasket joints and be in accordance with ANSI/AWWA C111/A21.11, latest revision. Joints shall have the same pressure rating as the pipe or fitting of which they are a part. Joints shall be installed per the manufacturer's recommendations.

F. Provide ANSI/AWWA C110/A21.10 mechanical joint plugs and locked or restrained pipe joints where indicated on Drawings. Fittings under structures shall be mechanical joint with retainer glands.

G. All piping and fittings with a 200’ radius of a petroleum underground storage tank shall be Ductile Iron with nitrile (NBR) gaskets per KDOW requirements.

2.2 HIGH DENSITY POLYETHYLENE PIPE (HDPE)

A. General: High density polyethylene pipe shall be DRISCOPLEX PE 4710 HDPE (DR11) pipe as manufactured by Chevron Philips Chemical Company, Inc. (formerly Philips Product Company), JM Eagle PE 4710 HDPE Water/Sewer (DR11) pipe as manufactured by J-M Manufacturing Company, Inc., ISCO PE 4710 HDPE (DR11) pipe as manufactured by ISCO Industries, LLC, or Engineer approved equal.

B. Materials for Polyethylene Pipe:

1. The polyethylene pipe and fittings shall be made of polyethylene resins classified in ASTM D 1248 as Type III, Category 5, Grade P34 (pipe designation PE 3408 defined per ASTM D 3035), having specific base resin densities of 0.941 g/cc minimum and 0.955 g/cc maximum respectively; and having melt index less than 0.15 grams/10 min.
2. Pipe made from these resins must have a long-term strength rating of 1,600 psi or more.
3. The polyethylene resin shall contain antioxidants and shall be stabilized with carbon black against ultra-violet degradation to provide protection during processing and subsequent weather exposure.
4. The polyethylene resin compound shall have a resistance to environmental stress cracking as determined by the procedure detailed in ASTM D 1693, Condition B with sample preparation by procedure C of not less than 200 hours.
5. Polyethylene shall have cell classification of 345464C as defined by ASTM 3350-05.

C. Polyethylene Pipe and Fittings:

1. The pipe shall be designed for a pressure rating of 200 psi (DR11).
2. Each length of pipe shall be marked, at no more than 10-foot intervals, with the following information:

    a. Nominal Pipe Size
    b. Type Plastic Material - PE3408
    c. Pipe Pressure Rating
    d. Manufacturer's Name, Trademark and Code

3. All pipes shall be made from virgin material. No rework compound.
4. Pipe shall be homogenous throughout, and be free of visible cracks, holes, foreign material, blisters, or other deleterious faults.
5. Fittings for the polyethylene pipeline shall be molded or fabricated from the same material as specified hereinbefore for the high-density polyethylene pipe.
6. Fittings for bends 22-1/2 degrees or greater shall be provided as shown on the Drawings. For alignment changes of less than 20 degrees deflection, the pipe may be laid in curves with a radius of 100 feet or greater.
7. All run-of-the-pipe fittings shall be fusion welded into the pipeline. Tee branches shall be of the size shown on the Drawings and shall be furnished with flanged ends per ANSI B-16.1. All fittings shall be factory-made.
8. Fittings shall be capable of withstanding the same pressure and loading conditions specified for the pipe.
9. Wye branches shall be true wyes.
10. The pipe shall be Iron Pipe Size (IPS).

D. Pipe Jointing:

1. Pipe to be joined by leakproof, thermal, butt fusion joints. All fusion must be done by personnel trained by the pipe supplier using tools approved by the pipe supplier.
2. The fusion machine shall have hydraulic pressure control for fusing 2 pipe ends together; it shall include pressure fusion indicating gauges to correctly monitor fusion pressures. The machines correctly monitor fusion pressures. The machines shall be equipped with an electric or gasoline engine powered facing unit to trim irregularities from the pipe ends. The heating plate on the fusion machine shall be electrically heated and thermostatically controlled and shall contain a temperature gauge for monitoring temperature.
3. Joint strength must be equal to that of adjacent pipe as demonstrated by tensile test. In addition, results of tensile impact testing of joint should indicate a ductile rather than a brittle fracture. The external appearance of fusion bead should be smooth without significant juncture groove.
4. Threaded or solvent cement joints and connections are not permitted.

E. Joining, Terminating or Adapting by Mechanical Means:

1. The polyethylene pipe shall be connected to systems or fittings of other materials by means of an assembly consisting of a polyethylene flange adapter butt-fused to the pipe, a backup ring of either cast iron, steel, or high silica aluminum alloy made to ANSI B-16.1 dimensional standards (with modified pressure ratings), bolts of compatible material (insulated from the fittings where necessary) and a gasket of reinforced black rubber, or other material approved by the Engineer, cut to fit the joint. In all cases, the bolts shall be drawing up evenly and in line.
2. Termination of valves, or fittings such as tees, bends, etc., made of other materials shall be by the flange assemblies specified hereinbefore. The pipe adjacent to these joints and to joints themselves must be rigidly supported for a distance of one pipe diameter or 1 foot, whichever is greater, beyond the flange assembly.
3. Appurtenances must be placed on their own foundations, unsupported by the pipe, in accordance with the detail plans.

F. Tools and Procedures:

1. Fusion jointing and other procedures necessary for correct assembly of the polyethylene pipe and fittings will be done only by personnel trained in those skills by the pipe supplier.
2. Only those tools designed for aforementioned procedures and approved by the pipe supplier shall be used for assembly of pipe and fittings to ensure proper installation.

2.3 MECHINCAL JOINT PIPE RESTRAINTS

A. Restrained Follower Glands for HDPE Pipe: Restraint for standard mechanical joint fittings on HDPE shall be incorporated in the design of the follower gland and shall utilize multiple wedge segments that act against the pipe, increasing their resistance as the line pressure increases. The assembled joint shall maintain the maximum flexibility and deflection of all nominal pipe sizes after burial. Restraining gland, wedge segments, and actuating bolts shall be manufactured of high strength ductile iron conforming to the requirements of ASTM A536, Grade 65-45-12. Wedge segments shall be heat treated to a hardness of 370 BHN minimum. Dimensions shall be

compatible with standardized mechanical joints conforming to the requirements AWWA C111/ANSI A21.11 and AWWA C153/ANSI 21.53 (latest revision). Breakaway tops shall be incorporated in the design of the actuating bolts to visually ensure proper torque. The actuating bolts must ensure precise and consistent operating torque of the breakaway top. The design of the restraining device shall be such that the gland body evenly bears the stress of the restraining load. The mechanical joint restraining devices shall have a minimum working pressure rating of 350psi for sizes 3 inches to 12 inches and 250 psi for 14 inches and larger and provide no less than a safety factor of 2:1. Restraint shall be UL Listed and FM approved in applicable sizes. The restraints shall be One Lok Series SLCE as manufactured by SIGMA, Series 2000PV as manufactured by EBAA Iron, or Engineer approved equal.

2.4 COUPLING AND ADAPTORS

A. Flexible couplings shall be of the sleeve type with a middle ring, two wedge shaped resilient gaskets at each end, two follower rings, and a set of steel trackhead bolts. The middle ring shall be flared at each end to receive the wedge portion of the gaskets. The follower rings shall confine the outer ends of the gaskets, and tightening of the bolts shall cause the follower rings to compress the gaskets against the pipe surface, forming a leak-proof seal. Flexible couplings shall be steel with minimum wall thickness of the middle ring or sleeve installed on pipe being 5/16-inch for pipe smaller than 10 inches, 3/8-inch for pipe 10 inches or larger. The minimum length of the middle ring shall be 5-inches for pipe sizes up to 10 inches and 7 inches for pipe 10 inches to 30 inches. The pipe stop shall be removed. Gaskets shall be suitable for 250 psi pressure rating or at rated working pressure of the connecting pipe. Couplings shall be harnessed and be designed for 250 psi.

B. Flanged adapters shall have one end suitable for bolting to a pipe flange and the other end of flexible coupling similar to that described hereinbefore. All pressure piping with couplings or adapters shall be harnessed with full threaded rods spanning across the couplings or adapters. The adapters shall be furnished with bolts of an approved corrosion resistant steel alloy, extending to the adjacent pipe flanges. Flanges on flanged adapter (unless otherwise indicated or required) shall be faced and drilled ANSI B16.1 Class 125.

C. Flexible couplings and flanged adapters shall be as manufactured by Dresser, Smith-Blair, or equal, per the following, unless otherwise specified and/or noted on the Drawings:

D. Steel couplings for joining same size, plain-end, steel, cast iron, and PVC plastic pipe.

Dresser	Smith-Blair
Style 138	411

E. Transition couplings for joining pipe of different outside diameters.

Dresser	Smith-Blair
Style 162 (4" to 12")	413 steel (2" to 24")
Style 62 (2" to 24")	415 steel (6" to 48")

F. Flanged adapters for joining plain-end pipe to flanged pipe, fittings, valves and equipment.

Dresser	Smith-Blair
Style 127 cast (3" to 12")	912 cast (3" to 12")
Style 128 steel (3" to 48" C.I. Pipe)	913 steel (3" and larger)

Style 128 steel (2" to 96" steel pipe)

2.5 DETECTABLE UNDERGROUND UTILITY WARNING TAPES

A. Detectable underground utility warning tapes which can be located from the surface by a non-ferrous metal detector shall be installed directly above nonmetallic (PVC, polyethylene, concrete) pipe.

B. The tape shall be a 5.0 mil tape with a 4.5 mil solid aluminum core in a protective polyethylene jacket that is impervious to all know alkalis, acids, chemical reagents and solvents found in the soil.

C. The minimum overall thickness of the tape shall be 5.0 mils and the width shall not be less than 2" wide. Tape width shall be dictated by waterline burial depth. The tape shall be color coded and imprinted with the legend as follows:

Type of Utility	Color Code	Legend
Water	Blue	Caution Buried Water Line Below

D. Detectable underground tape shall be “Underground Tape” as manufactured by Brimar, or approved equal.

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

F. Payment for detectable tapes shall be included in the linear foot price bid of the appropriate bid item(s) unless it is listed as a separate payment item in the bid schedule.

2.6 TRACER WIRE

A. Tracer wire shall be 12-gauge copper wire with 30-mil polyethylene jacket. Tracer wire shall be installed with all buried piping, "duct" taped to top of pipe. Tracer wire shall be secured to the top of the pipe by tape a minimum of 3 times on each standard length of pipe.

B. Split Bolt connectors are required when connecting two pieces of tracer wire. Wire and connector shall be wrapped with electrical tape.

C. Tracer wire shall be brought up into locator boxes with grounding devices. Locator boxes shall be valve boxes with a polystyrene donut that fits around the box to serve as a termination point for tracer wire. Locator boxes shall be installed at a maximum of 500 linear feet apart, or where shown on the Drawings.

D. Payment for tracer wire and boxes shall be included in the linear foot price bid of the appropriate bid item(s) unless it is listed as a separate payment item in the bid schedule

2.7 CONCRETE PIPE ANCHORS, THRUST BLOCKS, CRADLE OR ENCASEMENT

A. Where indicated on the Drawings, required by the Specifications or as directed by the Engineer, concrete pipe anchors, thrust blocks, cradles or encasements shall be installed.

B. Concrete shall comply the provisions in KYTC Standard Specifications Section 601 and be Class B. Reinforcing bars shall be installed as indicated on details.

2.8 PREFABRICATED TRENCH BAFFLES

A. Where indicated on the Drawings, required by the Specifications, or as directed by the Engineer, Contractor shall install pre-fabricated trench baffles in the pipeline trench.

B. The baffle shall be self-supporting, made of ABS (Acrylonitrile Butadiene Styrene) or comparable material, and shall provide a watertight seal around the pipe by use of an elastomeric PVC flexible coupling. The purpose of the baffle is to stop the flow of groundwater along the trench, and around the pipe. The trench baffle shall be "Ripley's Dam" as manufactured by EJP, or equal.

2.9 CONNECTION OF NEW WATER MAINS TO EXISTING SYSTEM

A. The Contractor shall connect the new water main to existing water main where shown on the Drawings or directed by the Engineer, and shall furnish all necessary equipment and materials required to complete the connection.

2.10 DUCTILE IRON FITTINGS

A. Fittings shall be pressure class 350 ductile iron and have mechanical-joints or push-on joints in accordance with ANSI/AWWA C110/A21.10, latest revision and shall conform to the details and dimensions shown therein. Fittings shall have interior cement-mortar lining as specified hereinbefore for the pipe. Compact ductile iron fittings meeting the requirements of ANSI/AWWA C153/A21.53, latest revision, will also be acceptable.

B. Joints for ductile iron pipe and fittings, as described hereinbefore, shall be rubber-gasket joints and be in accordance with ANSI/AWWA C111/A21.11, latest revision. Joints shall have the same pressure rating as the pipe or fitting of which they are a part. Joints shall be installed per the manufacturer's recommendations.

C. All fittings with a 200’ radius of a petroleum underground storage tank shall have nitrile (NBR) gaskets per KDOW requirements.

2.11 POLYETHYLENE (PE) TUBING

A. Customer service tubing shall be Polyethylene (PE) and conform to AWWA C901, ASTM F 741 with a pipe designation of PE 3408 defined per STM D 3035 for IPS sizes and ASTM D 2737 for CTS sizes. Customer service tubing size 1-inch, shall be CTS DR-9 (250 psi).

B. Service line tubing size 2-inch, shall be CTS DR-9 (250 psi). Casing tubing size 2-inch and 3-inch, shall be IPS DR-13.5 (160 psi).

2.12 CUSTOMER SERVICE RELOCATIONS AND RE-CONNECTIONS

Where water service lines are disturbed, the Contractor shall reconnect the existing service line to the new water main. The Contractor shall furnish and install the necessary piping, couplings, fittings, etc. necessary to complete the service line re-connection.

A. Service Lines Not Crossing a Road (Short Side)

1. Unless indicated otherwise on the plans, all service lines shall be of PE tubing.
2. Existing water meters shall be relocated and a new water meter setter and new meter box shall be installed unless otherwise indicated by the plans.
3. Water service connections shall be made in accordance with the details shown on the Drawings and/or set forth herein. Locations of the various sizes shall be as directed by the Engineer and as shown on the Drawings.

B. Service Lines Crossing a County Road or City Streets (Long Side)

1. Same as subparagraph A, except that in general all pipe may be jacked beneath certain paved or blacktopped city streets or county roads, unless solid rock prevents using this method in which case, the open trench method will be used. Schedule 40 steel pipe shall be used as casing pipe unless otherwise indicated by the plans. The open trench method generally will be used on all unpaved city streets, county roads and private driveways. In general, blacktopped private driveways shall also be jacked under. In all cases where lines are under traffic, a minimum cover of 36 inches shall be provided. All backfill shall be compacted by air tampers in layers no greater than 6-inch depth. Specific instructions as to the type of crossing to be installed will be shown on the plans.

C. Service Lines Crossing a State Highway

1. Casing pipe shall be directional drilled under paving where required on plans or by the KY Transportation Cabinet. Casing pipe shall be IPS DR-13.5 PE tubing.
2. Service piping shall be pulled through PE casing pipe. Unless indicated otherwise on the plans. All service lines shall be of PE tubing.
3. Existing water meters shall be relocated and a new water meter setter and meter box shall be installed.
4. Water service connections shall be made in accordance with the details shown on the Drawings and/or set forth herein. Locations of the various sizes shall be as directed by the Engineer as shown on the Drawings.

2.13 CORPORATION STOPS AND FITTINGS FOR HOUSE SERVICE RECONNECTIONS

A. Corporation stops, of the size required, shall be tapped directly into the water main for Ductile Iron Pipe or by the use of a tapping saddle for PVC pipe.

B. Corporation stops shall have AWWA C800-66 C.S. threaded inlet. Outlets shall be suitable for the type of service piping furnished and laid, and the Contractor shall verify compatibility with "iron pipe size" or "copper tubing size" service piping as required before ordering stops.

C. Corporation stops shall be Ford Meter Box Type F1000, F1001, F1002 (as required); Mueller H-15005, H-15006, H-15008, H-15009 (as required); Hayes Series 5200, or equal.

D. Fittings shall be brass.

2.14 SERVICE TAPPING SADDLES

A. Service tapping saddles shall consist of bronze outlet castings for OD controlled PVC pipe. Saddles shall consist of two wide bronze casted straps that are permanently hinged together on one side and bolted on the other side. The outlet shall have a thick tapping boss with enough surface on the exterior to apply a pipe wrench when installing the corporation stop. Castings shall be sealed to pipeline with O-ring seals. Saddle outlets shall be threaded per AWWA C800.

B. Service tapping saddles shall by style S-13000 as manufactured by Mueller Co. style S-70 as manufactured by Ford Meter Box Co., or approved equal.

2.15 COMPRESSION COUPLING FITTINGS FOR SERVICE RECONNECTIONS

A. Compression couplings shall comply with AWWA C800-NL. Outlets shall be suitable for the type of service piping furnished and laid, and the Contractor shall verify compatibility with "iron pipe size" or "copper tubing size" service piping as required before ordering stops.

B. Compression couplings shall be Ford Meter Box Type (as required); Mueller 110 Series, (as required); or approved equal.

2.16 METER BOXES

A. Meter box shall be plastic meter box as manufactured by Ford Meter Box Company, Carlson (Old Castle), or approved equal. Meter box shall have smooth interior and annular extension corrugations and shall be notched at 0 and 180 degrees at the base to accommodate inlet and outlet pipes.

B. Inner diameter of box shall be 18-inches. Minimum depth of box shall be 18 inches.

C. Box shall be high density polyethylene conforming with the minimum requirements of cell classification 424420 B as defined and described in the latest version of ASTM D3350.

2.17 METER BOX COVERS

A. Meter box cover shall be purchased from Oldham County Water District.

2.18 COPPER SETTERS

A. Meter setter shall be a copper setter as shown on the standard detail drawing with 3/4-inch double purpose ends and be 7-inches high. It shall be all purpose, designed for 5/8-inch x 3/4-inch meters, and be of sufficient height to raise meters above the bottom of the meter box. Setter shall be Ford as manufactured by the Ford Meter Box Company, or approved equal, and shall have an inverted key inlet valve and dual check backflow preventer outlet valve. Setters shall be installed so that the meter is centered in the box.

B. Copper shall conform to STM B-575 copper alloy #122.

C. For new customer service meter setting, the water service line shall be extended a minimum of 5 feet beyond the meter box on the customer end. The end of the extension shall be capped or plugged to prevent entry of foreign material until the house connection is made.

PART 3 - EXECUTION

3.1 EXCAVATION FOR PIPELINE TRENCHES

A. Unless otherwise directed by the Engineer, trenches in which pipes are to be laid shall be excavated in open cut to the depths required by field conditions or as specified by the Engineer. In general, this shall be interpreted to mean that machine excavation in earth shall not extend below an elevation permitting the pipe to be properly bedded. Installation shall be in accordance with ANSI/AWWA C600 for ductile iron and Cast Iron O.D. (AWWA) PVC pipe or ASTM F-645 for Iron Pipe O.D. (ASTM) PVC pipe except as modified herein.

B. If the foundation is good firm earth and the machine excavation has been accomplished as set out hereinbefore, the remainder of the material shall be excavated by hand, then the earth pared or molded to give full support to the lower quadrant of the barrel of each pipe. Where bell and spigot are involved, bell holes shall be excavated during this latter operation to prevent the bells from being supported on undisturbed earth. If for any reason the machine excavation in earth is carried below an excavation that will permit the type of bedding specified above, then a layer of granular material shall be placed so that the lower quadrant of the pipe will be securely bedded in compact granular fill.

C. Excavation may be undercut to a depth below the required invert elevation that will permit laying the pipe in a bed of granular material to provide continuous support for the bottom quadrant of the pipe. When this method is used, the bedding shall be as set out in Paragraph 3.2 hereinafter.

D. Trenches shall be of sufficient width to provide free working space on each side of the pipe and to permit proper backfilling around the pipe, but unless specifically authorized by the Engineer, trenches shall in no case be excavated or permitted to become wider than 2 feet plus the nominal diameter of the pipe at the level of or below the top of the pipe.
If the trench does become wider than 2 feet at the level of or below the top of the pipe, special precaution may be necessary, such as providing compacted, granular fill up to top of the pipe or providing pipe with additional crushing strength as determined by the Engineer after taking into account the actual trench loads that may result and the strength of the pipe being used. The Contractor shall bear the cost of such special precautions as are necessary.

E. All excavated materials shall be placed a minimum of 2 feet back from the edge of the trench.

F. Before laying the pipe, the trench shall be opened far enough ahead to reveal obstructions that may necessitate changing the line or grade of the pipeline.

G. The trench shall be straight and uniform so as to permit laying pipe to lines and grades given by the Engineer. It shall be kept free of water during the laying of the pipe and until the pipeline has been backfilled. Removal of trench water shall be at the Contractor's expense. Dry conditions shall be maintained in the excavations until the backfill has been placed. During the excavation, the grade shall be maintained so that it will freely drain and prevent surface water from entering the excavation at all times. When directed by Owner, temporary drainage ditches shall be installed to intercept or direct surface water which may affect work. All water shall be pumped or drained from the excavation and disposed of in a suitable manner without damage to adjacent property or to other work.

H. Minimum cover of 30 inches shall be provided for all pipelines, except those located in the State Highway Right of Way. Those shall have a minimum cover of 42 inches.

3.2 PIPE BEDDING

A. All pipe shall be supported on a bed of manufactured sand, derived from limestone, with gradation results similar to those shown in the table below. Contractor shall submit gradation test results to the Engineer for approval. Manufactured sand shall be washed and contain no fine particles and or dust. In no case shall pipe be supported directly on rock. Bedding shall be provided in earth bottom trenches, as well as rock bottom trenches. Bedding material shall be free from large rock, foreign material, frozen earth, and shall be acceptable to the Engineer. Bedding shall be a minimum of 6" below pipe barrel. Contractor shall be responsible for all dust control associated with the use of Manufactured Sand.

Sieve	% Retained	Cumulated % Retained	% Passing
3/8" (9.5mm)	0	0	100
#4 (4.76mm)	5	5	95
#18 (2.36mm)	43	48	52
#16 (1.18mm)	23	71	29
#30 (0.6mm)	8	79	21
#50 (0.3mm)	4	83	17
#100 (0.15mm)	3	86	14
#200 (75µm)	3.7	89.8	10.2
Pan (0µm)	1.1	100.0	0

B. In all cases the foundation for pipes shall be prepared so that the entire load of the backfill on top of the pipe will be carried on the barrel of the pipe so that none of the load will be carried on the bells.

C. Where flexible pipe is used, the bedding shall be placed up to at least the spring line (horizontal center line) of the pipe. The bedding material and procedures shall conform to ASTM D 2321 and any Technical Specifications set out hereinafter. If conditions warrant, the Engineer may

require the bedding to be placed above the spring line of the pipe. Granular bedding is not a separate pay item.

D. Where undercutting and granular bedding is involved, it shall be of such depth that the bottom of the bells of the pipe will be at least three inches above the bottom of the trench as excavated. Undercutting is not a separate pay item.

E. In wet, yielding mucky locations where pipe is in danger of sinking below grade or floating out of line or grade, or where backfill materials are of such a fluid nature that such movements of the 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. When ordered by the Engineer, yielding and mucky materials in subgrades shall be removed below ordinary trench depth in order to prepare a proper bed for the pipe. Crushed stone or other such granular material, if necessary, as determined by the Engineer to replace poor subgrade material, shall be a separate pay item and classified as "Special Granular Fill". Removal of poor material is not a separate pay item.

F. Installation shall be in accordance with ASTM D 2321 except as modified hereinafter.

3.3 SPECIAL GRANULAR FILL

A. Special granular fill shall comply with provisions in KYTC Standard Specifications Section 701.

3.4 LAYING PIPE

A. The laying of pipe in finished trenches shall be commenced at the lowest point so the spigot ends point in the direction of flow.

B. All pipes shall be laid with ends abutting and true to line and grade as given by the Engineer. Supporting of pipes shall be as set out hereinbefore under "Pipe Bedding" and in no case shall the supporting of pipes on blocks be permitted.

C. Before each piece of pipe is lowered into the trench, it shall be thoroughly inspected to ensure that it is clean. Each piece of pipe shall be lowered separately unless special permission is given otherwise by the Engineer. 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. 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.

D. Pipe shall not be laid on solid rock. A pad of granular material as specified in Paragraph 3.2 "Pipe Bedding", shall be used as a pipe bedding. Pipe bedding is not a separate pay item. Irregularities in subgrade in an earth trench shall be corrected by use of granular material.

E. When ordered by the Engineer, unsuitable materials in subgrades shall be removed below ordinary trench depth in order to prepare a proper bed for the pipe.

F. When laying of pipe is stopped for any reason, the exposed end of such pipe shall be closed with a plywood or fabricated plug fitted into the pipe bell, so as to exclude earth or other material, and precautions taken to prevent flotation of pipe by runoff into trench.

G. No backfilling (except for securing pipe in place) over pipe will be allowed until the Engineer has had an opportunity to make an inspection of the joints, alignment and grade, in the section laid.

3.5 BACKFILLING PIPELINE TRENCHES

A. Backfilling of pipeline trenches shall be accomplished as shown on the Drawings and with details set forth hereinafter. Before final acceptance, the Contractor will be required to level off all trenches or to bring the trench up to grade. The Contractor shall also remove from roadways, rights-of-way and/or private property all excess earth or other materials resulting from construction. In the event pavement is not placed immediately following trench backfilling in paved areas, the Contractor shall be responsible for maintaining the trench surface in a level condition at proper pavement grade at all times. Under pavement, all trench backfill shall be in accordance with Method C as shown on the Detail Drawings. All other trench backfill shall be in accordance with Method A or B.

B. Method "A" - Backfilling in Open Terrain.

Backfilling of pipeline trenches in open terrain shall be accomplished in the following manner:

1. The lower portion of the trench, from the pipe bedding to a point 12 inches above the top of the pipe, shall be backfilled with material free from rock and/or material acceptable to the Engineer. This material shall be placed in a manner approved by the Engineer and shall be carefully compacted to avoid displacement of the pipe. Compaction shall be accomplished by hand-tamping or by approved mechanical methods.

2. The upper portion of the trench above the compacted portion shall be backfilled with material which is free from large rock. Incorporation of rock having a volume exceeding one-half cubic foot is prohibited. Backfilling this portion of the trench may be accomplished by any means approved by the Engineer. The trench backfill shall be heaped over or leveled as directed by the Engineer.

C. Method "B" - Backfilling Under Sidewalks & Unpaved Driveways.

Backfilling of pipeline trenches under sidewalks and unpaved driveways shall be accomplished in the following manner:

1. The lower portion of the trench, from the pipe bedding to a point 12 inches above the top of the pipe, shall be backfilled with material free from rock and/or material acceptable to the Engineer. This material shall be placed in a manner to avoid displacement of the pipe. Compaction shall be accomplished by hand-tapping or by approved mechanical methods.

2. The middle portion of the trench, from a point 12 inches above the top of the pipe to a point 6 inches below the grade line, shall be backfilled with material free from rock and/or acceptable to the Engineer. This material shall be placed and compacted in layers

of approximately 6 inches. Water (puddling) may be used as required to obtain maximum compaction.

a. Upon approval of the Engineer, the Contractor may backfill the middle portion of the trench with crushed stone, fine gravel, or sand in lieu of materials which require compaction.

3. The upper portion of the trench shall be temporarily backfilled and maintained with crushed stone or gravel until such time as the sidewalk is constructed or the driveway surface is restored.

D. Method "C" - Backfilling Under Streets, Roads, and Paved Driveways.

Backfilling of pipeline trenches under streets, roads and paved driveways shall be accomplished in the following manner:

1. The lower portion of the trench from the pipe bedding to a point 6 inches below the bottom of the pavement or concrete sub-slab, shall be backfilled with # 9 crushed stone.

2. The upper portion of the trench, from a point 6 inches below the bottom of the pavement or concrete sub-slab to grade, shall be backfilled with a base course of dense graded aggregate. At such time that pavement replacement is accomplished, the excess base course shall be removed as required.

E. Trenches outside existing sidewalks, driveways, streets, and highways shall be backfilled in accordance with Method "A". Trenches within the limits of sidewalk and unpaved driveways shall be backfilled in accordance with Method "B". Trenches within the paving limits of existing streets, highways and driveways shall be backfilled in accordance with Method "C". All methods are shown on the Detail Drawings. When directed by the Engineer, the Contractor shall wet backfill material to assure maximum compaction.

1. Before final acceptance, the Contractor will be required to level off all trenches or to bring the trench up to grade. The Contractor shall also remove from roadways, rights-of-way and/or private property all excess earth or other materials resulting from construction.

2. In the event pavement is not placed immediately following trench backfilling in streets and highways, the Contractor shall be responsible for maintaining the trench surface in a level condition at proper pavement grade at all times.

3.6 SETTLEMENT OF TRENCHES

A. Whenever lines are in, or cross, driveways and streets, the Contractor shall be responsible for any trench settlement which occurs within these rights-of-way within one year from the time of final acceptance of the work. If paving shall require replacement because of trench settlement within this time, it shall be replaced by the Contractor at no extra cost to the Owner. Repair of settlement damage shall meet the approval of the Owner.

3.7 CONCRETE THRUST BLOCKS, CRADLE, ANCHORS OR ENCASEMENT

A. Concrete thrust blocks, cradle, anchors or encasement shall be placed where shown on the Drawings, required by the Specifications, or as directed by the Engineer.

B. For cradle and encasement, concrete shall be 3000 psi and shall be mixed sufficiently wet to permit it to flow under the pipe to form a continuous bed.

C. For thrust blocks and anchors, concrete shall be 3000 psi and shall be formed or be sufficiently stiff to maintain the forms indicated on the Details.

D. In tamping concrete, care shall be taken not to disturb the grade or line of the pipe or injure the joints. Concrete placed outside the specified limits or without authorization from the Engineer will not be subject to payment.

E. Water mains shall have concrete thrust or "kicker" blocks at all pipe intersections and changes of direction to resist forces acting on the pipeline. All reducers (increasers) shall be anchored.

3.8 BITUMINOUS CONCRETE HIGHWAY, STREET AND DRIVEWAY REPLACEMENT

A. The Contractor shall replace those sections of existing roads, streets and driveways required to be removed to install the pipelines under this contract. He shall construct same to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than that which existed prior to the operations.

B. Prior to trenching, the pavement shall be scored or cut to straight edges at least 12 inches outside each edge of the proposed trench to avoid unnecessary damage to the remainder of the paving. Edges of the existing pavement shall be re-cut and trimmed to square, straight edges after the pipeline has been installed and prior to placing the new base and pavement.

C. Backfilling of the trench shall be in accordance with Method "C" as described hereinbefore. Base course for the paving shall be dense graded crushed limestone furnished and placed in accordance with the current requirements of the Standard Specifications for Road and Bridge Construction of the Department of Transportation, to a depth of 6 inches in roads and streets and 4 inches in driveways.

D. A subslab of reinforced concrete shall be placed for state-maintained highways as indicated on the Drawings. The subslab shall have a minimum thickness of 6 inches. Concrete for the subslab shall be 3000 psi, in accordance with the Details shown on the Drawings.

3.9 UNPAVED DRIVEWAY (CRUSHED STONE) SURFACE REPLACEMENT

A. The Contractor shall replace those sections of existing driveways and parking areas required to be removed to install the pipelines under this contract. He shall construct same to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than that which existed prior to the operations.

B. Material for backfilling of the pipeline trench shall be dense-graded aggregate in accordance with Method "B" as described hereinbefore.

3.10 REMOVING AND REPLACING CONCRETE CURB AND GUTTER OR SIDEWALK

A. The Contractor shall remove the curb and gutter or sidewalk when encountered when required for laying the pipe. Only that portion of the curb and gutter or sidewalk needed to lay the pipe shall be removed.

B. Where concrete curb and gutter or sidewalk is removed or disturbed during the construction work, it shall be replaced, using 3000 psi concrete, in fully as good or better condition than that which existed prior to the Contractor's operation.

3.11 REPLACEMENT OF EXISTING MAILBOXES, CULVERTS, CLOTHESLINE POSTS, FENCES AND OTHER SUCH FACILITIES

A. Existing mailboxes, drainage culverts, clothesline posts, fences and the like shall not be damaged or disturbed unless necessary, in which case, they shall be replaced in as good condition as found as quickly as possible. Existing materials shall be reused in replacing such facilities when materials have not been damaged by the Contractor's operations. Existing facilities damaged by Contractor's operation shall be replaced with new materials of the same type at the Contractor's expense. Work in this category is not a pay item.

B. Replacement of paved drainage ditches within highway right-of-way shall be accomplished in accordance with Department of Transportation specifications.

3.12 PORTLAND CEMENT CONCRETE DRIVEWAY REPLACEMENT

A. Wherever Portland cement concrete driveways are removed, they shall be reconstructed to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than existed prior to the operation.

B. The existing concrete paving shall be sawed or cut to straight edges 12 inches outside the edges of the trench or broken out to an existing joint, as directed by the Engineer. The concrete pavement shall be equal to the existing pavement thickness but not less than 6 inches in thickness for driveways.

C. Pavement shall be reinforced with 6 x 6-W4.0 x W4.0 welded wire reinforcement and shall be constructed with 4500 psi concrete with a maximum water-cement ratio of 0.45 and water reducer to produce a workable mix.

3.13 RIP-RAP STREAM BANK SLOPE PROTECTION

A. The Contractor shall install rip-rap stream bank slope protection at locations directed by the Engineer. Rip-rap slope protection shall be 12 inches thick and shall meet State D.O.T. Standard Specifications.

3.14 TESTING

A. All pressure piping (lines not laid to grade) shall be given a hydrostatic test of at least 1-1/2 times the normal operating pressure of the pipe (at its lowest elevation), but not to exceed the rated working pressure of the pipe or valves. Note: Engineer shall verify test pressure.

B. Testing of HDPE pipe shall be as described in ASTM F2164 Standard Practice for Field Leak Testing of Polyethylene and Crosslinked Polyethylene Pressure Piping Systems Using Hydrostatic Pressure. The hydrostatic leak test procedure shall consist of filling, an initial expansion phase, a test phase and depressurizing. Pipe shall be pressurized to the test pressure and maintained for 4 hours, adding makeup water as needed to keep pressure constant. Then the test pressure shall be reduced by 10 psi and test liquid shall stop being added. The pressure shall be then monitored for one (1) hour. If no visual leakage is observed and the test pressure has not decreased more than 5% of the test pressure for one (1) hour, no leakage is indicated.

C. No water leakage in pipelines, when tested under the hydrostatic test described above, shall be allowed.

D. Contractor shall furnish a recording gauge and recording pressure charts during duration of test. Recording pressure charts shall be turned over to the Engineer at conclusion of tests. The pressure recording device shall be suitable for outside service, with a range from 0-200 psig, 24-hour clock, and shall be approved by the Engineer.

E. Pipelines shall be tested before backfilling at joints except where otherwise required by necessity or convenience.

F. Where leaks are visible at exposed joints, evident on the surface where joints are covered, and/or identified by isolating a section of pipe, the joints shall be repaired and leakage must be minimized, regardless of total leakage as shown by test.

G. All pipe, fittings, valves, and other materials found to be defective under test shall be removed and replaced at no additional expense to the Owner.

H. Lines which fail to meet tests shall be repaired and retested as necessary until test requirements are complied with.

I. Where nonmetallic joint compounds are used, pipelines should be held under normal operating pressure for at least three days before testing.

J. The Owner will provide initial water for testing the pressure piping. Should the first test fail to pass, all additional water required for subsequent tests shall be furnished at the Contractor's expense.

K. The cost of testing of pressure piping is incidental and is to be included in the Contractor's unit Contract Price.

3.15 CLEAN UP

A. Upon completion of installation of the piping and appurtenances, the Contractor shall remove all debris and surplus construction materials resulting from the Work. The Contractor shall

grade the ground along each side of pipe trenches in a uniform and neat manner leaving the construction area in a shape as near as possible to the original ground line.

3.16 DISINFECTION OF POTABLE WATER LINES

A. The new potable waterlines shall not be placed in service–either temporarily or permanently–until they have been thoroughly disinfected in accordance with AWWA Standard C651 latest edition, and to the satisfaction of the Engineer.

B. After testing, a solution of hypochlorite using HTH or equal shall be introduced into the section of the line being disinfected sufficient to insure a chlorine dosage of at least 50 ppm in the main. While the solution is being applied, the water should be allowed to escape at the ends of the line until tests indicate that a dosage of at least 50 ppm has been obtained throughout the pipe. Open and close all valves and cocks while chlorinating agent is in the piping system. The chlorinated water shall be allowed to remain in the pipe for 24 hours, after which a residual of at least 25 ppm shall be obtained. The disinfection shall be repeated until 25 ppm is obtained after which time the main shall be thoroughly flushed until the residual chlorine content is not greater than 1.0 ppm, and then may be connected to the system. Also, no additional payment will be allowed for providing taps for chlorine injection and/or flushing, if necessary. The Contractor is responsible for the disposal of highly chlorinated water flushed from the main, and shall follow the requirements of AWWA C655, latest edition, for dechlorinating the disinfecting water.

C. The new water line shall not be put into service until bacteriological samples taken at the points specified herein are examined and shown to be negative after disinfection, following the requirements of "Standard Methods for Examination of Water and Wastewater". Two consecutive sets of acceptable samples, taken at least 24 hours apart shall be collected from the new line. Samples are to be taken and tested at every 1200 feet of new water line, at each branch and at each dead end.

D. If trench water has entered the pipe, or excessive quantities of dirt or debris have entered the pipe, samples shall be taken at intervals of approximately 200 feet and the locations identified. Samples shall be taken of water that has stood in the new line for at least 16 hours after flushing is completed.

E. If the initial disinfection does not produce satisfactory bacteriological results, the new line shall be re-flushed and resampled. If samples fail, the line shall be re-chlorinated by the continuous-feed or slug method until satisfactory results are obtained.

F. All testing documentation shall be submitted to the Owner.

3.17 ALTERNATE METHOD OF INSTALLATION

A. In lieu of traditional trenching methods for pipe installation, with the approval of the Engineer, the Contractor may choose to install the pipe utilizing the trenchless technology of horizontal directional drilling (HDD). Horizontal directional drilling shall be as specified in Section 330523.

3.18 LAWNS AND GRASSES

A. Provide all labor, materials, and services required for seeding of all disturbed areas caused by construction activities and for installation of sod where indicated on the Contract Drawings or specified herein.

B. Lawns and grasses installation and maintenance shall comply with provisions in KYTC Standard Specifications Section 212.

END OF SECTION 331113

SECTION 331216 – VALVES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment and services required to furnish and install all valves shown on the Drawings and/or specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this Section.

B. Piping is specified in Division 33 Specification sections.

1.3 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 013323.

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.

C. In accordance with the requirements of the General and Special Conditions and this Section, the following table includes, but is not limited to, the items required to be submitted:

Item Description	Shop Drawings	Product Data	Schedules	Installation Data	Parts Lists	Wiring Diagram	Samples	O & M Manual	Certificates	Warranty	Report	Other
Valves	X	X			X							
Valve Boxes		X										
Access Manhole	X	X										
Yard Hydrant	X	X			X							
Tapping Sleeve, Valve	X	X		X	X							

PART 2 - PRODUCTS

2.1 GATE VALVES

A. Gate valves shall conform with AWWA C-509 standard, and shall be of the resilient seat type, iron body, fully bronze mounted, non-rising stem and have a design working pressure of 250 psi. All assembly bolts shall be stainless steel. Valves shall be of standard manufacturer and of the highest quality both as to materials and workmanship.

B. All gate valves shall be furnished with mechanical joint connections, unless otherwise shown on the Drawings or specified hereinafter.

C. An epoxy coating conforming to AWWA C-550 shall be applied to the interior and exterior ferrous surfaces of the valve except for finished or seating surfaces.

D. All gate valves shall have the name or monogram of the manufacturer, the year the valve casting was made, the size of the valve, and the working water pressure cast on the body of the valve.

E. Gate valves 12 inches and smaller shall be installed in a vertical position. Gate valves greater than 12 inches shall have the bonnet mounted in the horizontal position and have a bevel gear actuator. Gate valves shall be provided with a 2-inch square operating nut and shall be opened by turning to the left (counterclockwise). All valve operating nuts shall be set within a cast iron valve box. There shall be a maximum 48-inch depth of valve operating nut. Contractor must use extension stems, if necessary, to raise operator nut within 48 inches of final grade.

F. Gate valves shall be Mueller A2360 or engineer approved equal.

2.2 INSERTION VALVES

A. The Insertion Valve shall consist of three subassemblies: the Valve Body, which shall be mounted pressure tight around the main; the Valve Cartridge, which shall be inserted, under full line pressure, into the Valve Body; and the Cartridge Closure Flange, which shall secure and permanently seal the Valve Cartridge into the Valve Body. Insertion valves shall be available for installation on 4-inch, 6-inch, 8-inch, 10-inch, 12-inch and 16-inch nominal pipe sizes.

B. Valve Body: The valve body shall consist of a two-part 304L stainless steel tapping saddle with a stainless steel tapping/insertion outlet, welded to the upper half of the saddle. The two part body shall be assembled around the pipe and pressure-sealed to the main by a single griddled resilient sheet gasket and throat gasket. The gasket shall fully encircle the pipe, providing a 360-degree full area seal. Suitable fasteners and supporting lugs shall be provided, as specified below.

1. Saddles shall be fabricated of Type 304L stainless steel. The design of the saddles, bolts, lugs and armor plates shall be such that the saddle halves can be mounted, without further modification, pressure-tight around the pipe. Contractor shall excavate and expose the existing pipe to verify the existing pipe type and size prior to ordering the insertion valve.

2. Bolting lugs shall be Type 304L stainless steel weldments and shall be designed and positioned on the saddle halves to insure accurate assembly of both halves. After assembly around the pipe, the vertical spacing of the bolting lugs between the two saddle halves shall allow adjustment to accommodate the range of pipe diameters specified above.

3. Bolting studs, nuts, along with any formed metal washers shall be fabricated from Type 304 stainless steel. All screw threads shall be 5/8-11UNC-2 (coarse). Nuts shall be heavy series.

4. Sheet Gasket shall be molded from a virgin SBR elastomer compound that will resist compression set and is compatible with cold drinking water in the normal 32 to 120 degrees. A griddled ("waffle") pattern shall be molded on the inner side of the gasket. Each side (which lies parallel to the run of the pipe) of the Gasket shall be tapered to allow uniform distribution of clamping (gasket) pressure over the entire circumference of the pipe. A stainless steel Armor Plate shall be attached to each side of the Gasket to bridge the gap between the saddle halves.

5. The tapping/insertion outlet on the upper saddle half shall be fabricated from Type 304 stainless steel, and shall have a flange welded to the outlet neck with locking pins to mate with the top groove of the Stuffing Box Plate (which is part of the Valve Cartridge). Below these locking pins, the interior of the outlet shall be accurately bored to seal against the O-ring contained in the stuffing box plate. The bore shall be further machined to provide a shoulder to vertically locate the Valve Cartridge when it is inserted into the Body. Two opposing rectangular keyways shall be machined into the interior wall of the outlet to receive the guide keys on the Valve Cartridge carrier.

C. The Valve Cartridge shall consist of a stuffing box plate, valve stem with operating nut, valve plugging head that shall consist of a carrier with an internal deformable sealing element and two external resilient sealing sleeves, and ancillary parts and fasteners. This cartridge shall be inserted into the outlet under full line pressure by means of a Cartridge Inserter.

1. The stuffing box plate shall retain the collar of the valve stem against the cartridge closure flange to prevent vertical motion during normal operation of the Insertion Valve. Suitable thrust washers shall be installed above and below the stem collar.

    a. The bore of this plate shall provide a pressure sealing surface for o-rings mounted on the valve stem.
    b. The exterior of this plate shall be grooved to receive locking pins installed from the nozzle flange after plate has been inserted into the nozzle and has seated against the internal nozzle shoulder. Below this pin groove, the plate shall be further machined to accept an o-ring to provide a pressure-seal between the exterior of the plate and the bore of the nozzle.

2. Valve Stem: The stem shall be machined from 304 stainless steel with a 700 LB torque capacity. During normal operation of the Insertion Valve, rotation of the stem shall advance the valve carrier with sealing devices into the fully closed position to stop flow in the pipe. Reversal of stem rotation shall retract the carrier into the completely open position, allowing full flow through the main.

a. The Owner shall specify the valve stem to be machined to open the valve by turning it clockwise (open right) or counter clockwise (open left), prior to ordering.
b. The top the stem shall be provided with a detachable, 2-inch square operating nut.
c. Valve shall be operated at 3 turns per inch for 4 inches through 16 inches.

3. The valve plugging head shall consist of two major components: rigid cylindrical carrier and three elastomer sealing devices, along with connecting parts and fasteners.

a. The carrier shall be a rigid, solid cylinder, turned to provide clearance to enter the access (tapped) hole in the pipe. A vertical central slot shall be machined into the lower portion of the carrier. This slot shall contain a single flat deformable sealing element. The carrier shall consist of a solid CM-909 body with rubber coating on the middle half of the CM-909 body.
b. The bottom of carrier shall be hemispherical to generally conform to the bore of the pipe. It shall be designed to break and to dislodge tuberculation and other deposits that might interfere with a suitable shutdown.
c. The carrier top, above the slot, shall contain an internal stainless steel thread to mate with that on the valve stem. Suitable mechanical means shall be provided to attach the deformable element to the carrier to insure retraction upon opening.
d. Rectangular guide keys shall be inserted to the top of the carrier. These keys shall be positioned to engage with and slide in the keyways machined into the interior walls of the outlet. This action shall maintain alignment of the valve cartridge when the Insertion Valve Plus is operated.
e. A single deformable sealing element shall be contained inside the slot in the carrier. The element shape shall be generally flat with the lower end semi-circular to seal the bottom of the pipe. The carrier shall deform that element into sealing contact with the pipe wall when the Insertion Valve is closed.
f. A resilient sleeve shall be attached to each of the two vertical cylindrical sides of the carrier. When the Insertion Valve is closed, these two sleeves shall seal against the deformable element and those surfaces of the pipe not sealed by the element, thereby completing the shutdown.

D. The cartridge closure flange with a flat flange gasket shall be used to complete the installation of the Insertion Valve. After the stuffing box plate has been seated on the shoulder in the outlet and the lock screws have been tightened from the outlet Flange, the Valve Cartridge shall be mechanically secure in the Valve Body. All water leakage paths shall be sealed. A Stem o-ring shall pressure-seal against a bored hole in the closure flange. The flange shall then be bolted to the outlet flange, followed by installation of the valve operating nut.

E. The Insertion shall be Insta-Valve Plus as manufactured by Hydra-Stop, Alsip, Il. The Insta-Valve Plus does not guarantee a 100% shutdown due to unknown factors within the pipe. The Insta-Valve Plus shall be rated to 150 PSI working pressure and 225 PSI test pressure.

2.3 VALVE BOXES - BURIED VALVES

A. Valve boxes shall be of 5-1/4 inch standard cast iron, two-piece, screw type valve box with drop cover marked "WATER". Valve boxes for gate valves larger than 8 inches shall be three-piece. Valve boxes shall be accurately centered over valve operating nut, and backfill thoroughly tamped about them. Valve boxes shall not rest on the valves but shall be supported

on crushed stone fill. They shall be set vertically and properly cut and/or adjusted so that the tops of boxes will be at grade in any paving, walk or road surface, and in grass plots, fields, woods or other open terrain. Valve boxes and covers shall be as manufactured by Tyler Corporation, Opelika Foundry, or equal.

B. Contractor shall furnish two (2) 6-foot T-handle operating wrenches for underground valves. Nut operator extensions for all valves buried deeper than 3 feet shall be provided with stem extensions sufficient to raise operator nut to within 3 feet of finished grade.

C. Valve boxes shall have extension stems, where necessary when operating nut is raised to be within 4 feet of the existing grade.

D. Wherever valve boxes fall outside of the pavement, the top of the box shall be set in a cast-in-place concrete slab 18 inches x 18 inches x 4 inches thick with the top of the slab and box flush with the top of the ground. This provision shall apply to all new and all existing valve boxes which fall within the limits of the contract, unless otherwise stated on the plans or ordered by the Engineer.

2.4 TAPPING SLEEVES AND VALVES

A. SST tapping sleeves for use in connections to existing water lines, where indicated on the drawings or as directed by the Engineer, shall have the body and neck constructed of ASTM A-240 type 304 stainless steel and shall be compressed to the carrier pipe by use of heavy gauge triangular sidebars running the length of the body. Bolts, nuts and washers shall be constructed of type 304 stainless steel. The gasket between the tapping sleeve and carrier pipe shall be constructed of Buna N rubber and be NSF 61 approved. The gasket shall have a grid pattern to help secure it in place and have seal around the full circumference of the pipe. Tapping outlet connections shall be constructed of ductile iron conforming to ASTM A-536 and have either a mechanical joint connection conforming to AWWA C-111, or a flanged connection with drillings in accordance with ANSI class 125#/150#. Tapping Sleeves shall be suitable for the following working pressures: 4-inch to 12-inch 250 psi, 14-inch to 24-inch 200 psi and shall be Mueller No. H-304, Romac Industries SST III, or approved equal.

B. Tapping valves shall meet the requirements of paragraph 2.01 hereinbefore and shall be coordinated to connect to the tapping sleeve with either a flanged end or a mechanical joint end. Tapping gate valves shall be Mueller T2360 or approved equal.

C. All existing water mains to be tapped under this contract shall be exposed in order to verify line sizes prior to ordering tapping sleeves and valves.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All valves shall be installed in accordance with details on the Contract Drawings and with the manufacturer's recommendations.

B. All valves shall be anchored in accordance with the details on the Contract Drawings.

END OF SECTION 331216

SECTION 331219 – HYDRANTS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment and services required for furnishing and installing all hydrants and appurtenances specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork: Section 312000

B. Valves - Utilities Services: Section 331216

C. Water Distribution Piping: Section 331113

1.3 SUBMITTALS

A. Submit shop drawings and product data in accordance with Section 013323 of this specification.

B. 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.

C. In accordance with the requirements of the General and Special Conditions and this Section, the following table includes, but is not limited to, the items required to be submitted:

Item Description	Shop Drawings	Product Data	Schedules	Installation Data	Parts Lists	Wiring Diagram	Samples	O & M Manual	Certificates	Warranty	Report	Other
Hydrants	X	X		X	X							

PART 2 - PRODUCTS

2.1 FIRE HYDRANTS

A. The Contractor shall furnish and install fire hydrants and auxiliary gate valves where shown on the Drawings or directed by the Engineer. Hydrants shall conform in all respects to the most recent requirements of AWWA C502. Hydrant barrel shall have safety breakage feature above the ground line. All hydrants shall have 6-inch mechanical joint shoe connection, two 4-1/2-inch pumper nozzle with rubber gasketed caps fitted with cap chains. Cap nuts are to be five (5) sided. Connection threads shall be National Standard Thread. Main valve shall have 5-1/4-inch full opening and be of the compression type opening against water pressure so that valve remains closed should barrel be broken off.

B. Hydrants shall be fully bronze mounted. Main valve shall have a threaded bronze seat ring assembly of such design that it is easily removable by unscrewing from a threaded bronze drain ring. Bronze drain ring shall have multiple ports providing positive automatic drainage as the main valve is opened or closed. Drainage waterways shall be completely bronze to prevent rust and corrosion.

C. The operating nut shall be five-sided bronze or bronze with a five-sided ductile iron cap and mounted so that a counterclockwise motion will open the valve. There must be cast on top an arrow and the word "Open" indicating the direction of turn to open the hydrant.

D. Operating stem shall be equipped with anti-friction thrust bearing to reduce operating torque and assure easy opening. Stop shall be provided to limit stem travel. Stem threads shall be enclosed in a permanently sealed lubricant reservoir protected from weather and the waterway with O-ring seals.

E. Hydrants shall be shop tested to 300 psi pressure with main valve both opened and closed. Under test the valve shall not leak, the automatic drain shall function and there shall be no leakage into the bonnet.

F. Type of shoe connection shall be mechanical joint and size shall be 6 inches.

G. Hydrants shall be given two coats of enamel high visibility paint (Yellow) paint to be selected by the Owner.

H. Hydrants shall be Mueller Super Centurion Model A-425 or approved equal.

2.2 FLUSH HYDRANTS

A. Flush type fire hydrants shall comply, where applicable, to AWWA Standard C-502, latest revision. Flush type fire hydrants shall be of the compression type, with the main valve opening against the pressure and closing with the pressure. The main valve opening shall be one way 2-1/2 inches in diameter. Flush type fire hydrants shall be of a post type dry barrel design.

B. Flush type fire hydrants shall be rated at 150 psi water working pressure, tested at 300 pounds hydrostatic for structural soundness in the following manner: 300-pound hydrostatic test

supplied from the inlet side, first with the main valve closed for the testing of the valve seat; second, with the main valve open for testing of the drain valves and the hydrant barrel.

C. Hydrants shall be constructed of ASTM A-126 Class B cast iron. The main valve of the hydrant shall be made of rubber.

D. The bottom stem threads of the main valve rods shall be fitted with a cap nut for sealing the threads away from the water.

E. Changes in size or shape of the waterway shall be accomplished by means of easy curves. Exclusive of the main valve opening, the net area of the waterway of the barrel and the foot piece at the smallest part shall not be less than 120 percent of that of the net opening of the main valve, except for hydrants with 2-1/4-inch valve opening.

F. Hose and steamer caps shall be individually chained to the hydrant.

G. The operating threads of the hydrant shall be so designed as to avoid the working of any iron or steel parts against either iron or steel. The operating stem and operating nut threads shall be square or acme type.

H. Bonnet shall be weatherproof, free draining, and of a type that will maintain the operating mechanism in readiness for use under freezing conditions.

I. The operating nut shall be provided with a convenient means to afford lubrication to insure ease of operating and the prevention of wear and corrosion. Hydrants shall be of dry barrel type. Hydrant shoe shall have two positive acting non-corrodible drain valves that shall drain the hydrant completely by opening when the main valve is closed, and also to close tightly when the main valve is open.

J. All like parts of hydrants of the same size and model produced by the same manufacturer shall be interchangeable.

K. Hydrants shall open by turning to the left.

L. Threads on hose and steamer nozzles shall be National Standard unless otherwise specified.

M. Operating nuts and cap nuts shall conform to National Standard unless otherwise specified.

N. Bury shall be 42 inches measuring depth from grade line to bottom of connecting pipe.

O. Auxiliary shut-off (isolation) gate valves shall be of the same manufacturer as the hydrant when required.

Q. The inside of all hydrants shall be coated in accordance with AWWA standards except for bronze and machined surfaces. Exterior on hydrant nozzle section shall be painted fire hydrant red (or as specified).

R. Hydrant shoe shall have protective, thermosetting epoxy coating applied inside and out before assembly. Prior to application of coating, shoes shall be mechanically and chemically cleaned in compliance with SSPC Standards SP-5 and SP-8. A minimum average dry film thickness of 3

mils shall be applied on interior and exterior surfaces of hydrant shoe. Coating designation to be M&H 0271 epoxy and conform fully to AWWA C550-81, Section 3.

S. Hydrants shall be marked with name of manufacturer, year of manufacture, and size.

H. Hydrants shall be Mueller A-411 2-1/8" Post Type Fire Hydrant or engineer approved equal.

PART 3 - EXECUTION

3.1 SETTING OF FIRE HYDRANTS

A. Location:

1. Hydrants shall be located as shown or as directed so as to provide complete accessibility and minimize the possibility of damage from vehicles or injury to pedestrians.
2. When placed behind the curb, the hydrant barrel shall be set so that the pumper or hose nozzle cap will be a minimum of 5 feet from the back of curb.
3. When set in the lawn space between the curb and the sidewalk or between the sidewalk and the property line, no portion of the hydrant or nozzle cap shall be within 6 inches of the sidewalk.

B. Position:

1. All hydrants shall be set plumb with not less than 2 cubic feet of crushed stone and shall have their nozzles parallel with the roadway, with the pumper nozzle facing toward the roadway. Hydrants shall be set to the established grade, with nozzles at least 18 inches above the ground, as shown or as directed by the Engineer.

C. Connection to Main:

1. Each hydrant shall be connected to the main with a 6-inch restrained joint ductile iron branch controlled by an independent 6-inch gate valve, unless otherwise specified.

D. Hydrant Drainage in Pervious Soil:

1. Whenever a hydrant is set in soil that is pervious, drainage shall be provided at the base of the hydrant by placing uncrushed coarse aggregate (AASHTO M-43) No. 57 from the bottom of the trench to at least 6 inches above the drain opening in the hydrant and to a distance of 1 foot around the elbow. No drainage system shall be connected to a sewer.

E. Hydrant Drainage in Impervious Soil:

1. Whenever a hydrant is set in clay or impervious soil, a drainage pit 2 feet in diameter and 3 feet deep shall be excavated below each hydrant and filled compactly with uncrushed coarse aggregate (AASHTO M-43) No. 57 under and around the elbow of the hydrant and to a level of 6 inches above the drain opening. No drainage pit shall be connected to a sewer (see Standard Details).

3.2 SETTING OF FLUSH HYDRANTS

A. Location:

1. Hydrants shall be located as shown on the Contract Drawings or as directed by the Owner or Engineer so as to provide complete accessibility and minimize the possibility of damage from vehicles or injury to pedestrians.

B. Position:

1. Hydrants shall be set plumb and to the established grade.

C. Connection to Main:

1. Hydrants shall be connected to the main by mechanical joint, screwed or flanged shoe. Mechanical joint shoes shall be fitted with strapping lugs.

D. Hydrant Drainage in Pervious Soil:

1. Whenever a hydrant is set in soil that is pervious, drainage shall be provided at the base of the hydrant by placing uncrushed coarse aggregate (AAHSTO M-43) No. 57 from the bottom of the trench to at least 6 inches above the drain opening in the hydrant and to a distance of 1 foot around the elbow. No drainage system shall be connected to a sewer.

E. Hydrant Drainage in Impervious Soil:

1. Whenever a hydrant is set in clay or impervious soil, a drainage pit 2 feet in diameter and 3 feet deep shall be excavated below each hydrant and filled compactly with uncrushed coarse aggregate (AASHTO M-43) No. 57 under and around the elbow of the hydrant and to a level of 6 inches above the drain opening. No drainage pit shall be connected to a sewer (see Standard Details).

3.3 ANCHORAGE

A. The bowl of each hydrant shall be tied to the pipe with suitable anchor couplings, as shown on the Standard Details in the Drawings or as directed by the Owner or Engineer.

3.4 FIRE HYDRANT WRENCHES

A. One hydrant wrench shall be furnished for each 10 hydrants or less. When the number of hydrants furnished and installed exceeds 25, one hydrant repair kit shall be supplied at no additional cost to the Owner.

END OF SECTION 331219

DIVISION 46

WATER AND WASTEWATER EQUIPMENT

SECTION 462010 – INTERIOR PROCESS PIPING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment and services required to furnish and install all plant process piping as shown on the Drawings and specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Process Valves: Section 462012

B. Piping furnished with equipment is included in the specific equipment item.

1.3 SUBMITTALS

A. The Contractor shall comply with the requirements of Section 013323 of these specifications.

B. A notarized certification shall be furnished for all pipe and fittings which verifies compliance with all applicable specifications.

PART 2 - PRODUCTS

2.1 DUCTILE IRON PIPE/DUCTILE IRON FITTINGS

A. Unless otherwise noted or required, all inside ductile iron piping shall be flanged pipe with threaded flanges in accordance with AWWA C 115. All piping flanges shall have ring gaskets, 1/8-inch thick.

B. All exposed iron pipe to be field painted shall be furnished with an external coating of rust inhibitive primer, such as Tnemec Series 1 OmniThane, Sherwin-Williams Corothane I GalvaPac, or equal. Pipe manufacturer shall be responsible for compatibility of shop applied coatings with the field paint systems and products specified in Division 09. Do not apply asphalt or bituminous coatings on pipe to be painted.

C. The interior of all ductile iron pipe shall be cement-mortar lined with bituminous seal coat in accordance with AWWA C 104. Thickness of the lining shall be as set forth in Section 4.8.1 of the aforementioned specification unless otherwise directed by the Engineer.

D. Ductile iron fittings shall conform to AWWA C 110 with flanges faced and drilled 125-lb. Fittings shall have interior lining and exterior coating same as the pipe.

2.2 INTERLOCKING LINK PIPE SEALS

A. In all locations indicated on the Drawings, interlocking link pipe seals shall be used in lieu of lead packing a pipe wall sleeve. Seals shall be modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall sleeve. Links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with a pressure plate under each bolt head and nut. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide an absolutely water-tight seal between the pipe and wall sleeve. Seals shall be "Link-Seal" as manufactured by Garlock or approved equal.

B. The Contractor shall determine the required diameter of each individual wall opening according to the manufacturer's recommendations before ordering and installing the seal. Pipe shall be accurately centered in the sleeve and the link seals shall be sized, installed and tightened in accordance with the manufacturer's instructions.

2.3 COUPLINGS AND ADAPTERS

A. Flexible couplings shall be of the sleeve type with a middle ring, two round-wedge shaped rubber gaskets at each end, two following rings together and compress the gasket against the pipe. Flexible couplings shall be steel with minimum wall thickness of the middle ring or sleeve installed on pipe being 5/16 inch for pipe smaller than 10 inches, 3/8 inch for pipe 10 inches or larger. The minimum length of the middle ring shall be 5 inches for pipe sizes up to 10 inches and 7 inches for pipe 10 inches to 30 inches. The pipe stop shall be removed. Gaskets shall be suitable for 250 psi pressure rating or at rated working pressure of the connecting pipe. Couplings shall be harnessed and be designed for 250 psi.

B. Flanged adapters shall have one end suitable for bolting to a pipe flange and the other end of flexible coupling similar to that described hereinbefore. All pressure piping with couplings or adapters shall be harnessed with full threaded rods spanning across the couplings or adapters. The adapters shall be furnished with bolts of an approved corrosion resistant steel alloy, extending to the adjacent pipe flanges. Flanges on flanged adapter (unless otherwise indicated or required) shall be faced and drilled ANSI B16.1 Class 125.

C. Flexible couplings and flanged adapters shall be as manufactured by Dresser, Rockwell, or equal, per the following, unless otherwise specified and/or noted on the Drawings:

1. Steel couplings for joining same size, plain-end, steel, cast iron, and PVC plastic pipe:

Dresser	Smith-Blair
Style 253 (2"-15")	411
Style 38/138 (18" & above)	

2. Transition couplings for joining pipe of different outside diameters.

Dresser	Smith-Blair
Style 162 (4"-12")	413 steel (2"-24")
Style 62 (2"-24")	415 steel (6"-48")
	433 cast (2"-16")
	435 cast (2"-12")

3. Flanged adapters for joining plain-end pipe to flanged pipe, fittings, valves and equipment.

Dresser	Smith-Blair
Style 227 cast (3"-12")	912 cast (3"-12")
Style 128 steel (3"-48" D.I. Pipe)	913 steel (3"-24" D.I. Pipe)
Style 128 steel (2"-96" steel pipe)	

2.4 FLANGED JOINTS

A. Flange bolts and nuts shall be ASTM A 307, Grade B and shall have hexagonal heads. All bolts, nuts and studs for flanged pipe in submerged locations shall be of 300 Series stainless steel. The flanges shall be drawn together until the joint is perfectly tight, with bolts of a length such that they will not project greater than 1/4-inch from the nut nor fall short of the end of the nut when drawn up. No washers shall be used. Gaskets shall be carefully fabricated prior to installation and must be suitable for pressure rating for the pipe for which it is used.

B. All flanges (unless otherwise indicated or required) shall be faced and drilled ANSI B16.1 125-lb. for ductile iron and ANSI B16.5 150-lb. for steel.

C. At the Contractor's option, and at no additional expense to the Owner, the following patented SBR flange gaskets or approved equal may be substituted for standard sheet packing ring gaskets in ductile iron flanged pipe:

1. TORUSEAL by American Cast Iron Pipe Company
2. FLANGE-TYTE by United States Pipe & Foundry Company

When using such gaskets, flange bolts shall be torqued to manufacturer's recommended torque values.

2.5 DISMANTLING JOINT

A. The dismantling joint shall be a double-ended flanged adapter that allows for longitudinal adjustment in a flanged piping system. It shall be made up with a flanged telescoping slip pipe piece inside a flanged adapter with integral control rods passing through both flanges. The telescoping pipe piece and flanged adapter shall be made from carbon steel and be factory primed. Tie rods shall be steel ASTM A193 grade B1 and the nuts shall be steel ASTM A194 grade H2. The rubber pipe gasket between the telescoping pipe and the flange adapter shall be Buna-S rubber. Flanges shall conform to either ANSI B16.5 class 150 or class 300 to match the ANSI B16.1 class 125 or class 250 pipe flanges as indicated on the drawings, and as defined hereinafter in paragraph 2.8. The dismantling joint shall have a maximum working pressure equal to the working pressure of the associated mating flange, being 250 psi or 300 psi respectively.

B. The dismantling joint shall be Style 131 as manufactured by Dresser, or approved equal.

2.6 METAL PIPE SUPPORTS AND HANGERS

A. The Contractor shall furnish and install all pipe hangers, inserts, brackets, plates, anchors, and other supports not specifically included under other items. Generally, pipe supports are not shown on the Drawings, but shall be supplied as specified herein. However, any bracing or support details shown on the Drawings shall be followed.

B. Prior to installation, the Contractor shall submit to the Engineer for review, manufacturer's data sheets on all catalogued items to be used and sketches covering all specially designed hanger and support assemblies and fabrications.

C. Supports and hangers shall be as manufactured by Grinnell, Elcen, or Fee & Mason, or equal or fabricated by the Contractor. Field fabricated supports may be used only for special conditions where manufactured items may not be suitable. In such cases, details of proposed supports shall be submitted to the Engineer for review. All such supports shall be galvanized.

D. Except as shown on the Drawings or as directed by the Engineer, supports and hangers shall be as follows:

1. Pipes with centerlines less than 24 inches from a wall shall be supported by a typical wall support bracket. Pipes with centerlines less than 6 feet above a floor shall be supported from below. All other pipes shall be hung from above. Piping shall be supported at no greater than 10 feet 0 inches on centers.
2. Pipe supported from underneath shall have adjustable pipe saddle supports on properly sized pipe stanchions. The saddle assembly shall be of cast iron. Standard pipe stanchions with hold-down "U" bolts shall be Grinnell Fig. 259, Elcen Fig. 49, Fee & Mason Fig. 2595, or equal.
3. Hangers are to be suspended from concrete work. Hangers shall be supported from approved metal inserts placed in concrete before the concrete is placed. Standard concrete inserts shall be Grinnell Fig. 28l or 282, Elcen Fig. 86 or 65, Fee & Mason Fig. 186 or 2570, or equal. If special support from overhead concrete is necessary due to unusually heavy loads, support shall be as detailed on the Drawings. In no case shall standard concrete inserts be used where pipe load exceeds the manufacturer's recommended load for the insert, or where the hanger rod exceeds 7/8 inch diameter.
4. All pipe hangers, inserts, clamps, supports and other like items shall be submitted for review by the Engineer prior to installation.
5. All inside horizontal flanged piping shall be supported with approved split ring type adjustable hangers of malleable iron with suitable hanger rods unless shown otherwise on the Drawings. Special supports shall be constructed in accordance with details shown on the Drawings. Wall supports and/or hangers shall be placed not over 10 feet apart. All piping shall be rigidly supported to prevent loosening under vibration.
6. Pipe, valve operating stems, fixtures and conduits shall be bracketed or suspended from walls, ceilings, and beams at or near valves and fittings and where needed for firm support, by standard brackets, rods, turnbuckles, and rings made especially for pipe of sizes supported. Perforated strap iron and/or copper will not be acceptable.
7. Clevis hangers for "iron pipe size" O.D. pipe shall be Grinnell Figure 65, Elcen Figure l2, Fee & Mason Figure 239, or equal. Clevis hangers for Cast Iron O.D. pipe shall be Grinnell Figure 260, Elcen Figure 12C, Fee & Mason Figure 104, or equal. All clevis hangers shall be galvanized.
8. Turnbuckles shall be forged steel. Rods shall be of black steel, machine threaded of following sizes:

Pipe Size	Rod Diameter
1/2" - 2"	3/8"
2-1/2" - 3"	1/2"
4" - 5"	5/8"
6"	3/4"
8" - 12"	7/8"
14" - 16"	1"
18"	1-1/8"
20" - 24"	1-1/4"

9. Brackets shall be of standard castings of fabricated steel and shall be reviewed by the Engineer. Standard catalogued bracket shall be medium duty Grinnell Fig. 195, Elcen Fig. 57, Fee & Mason Fig. 151, or equal, galvanized, size as noted on Drawings. Provide light or heavy duty brackets if specifically noted on Drawings. "U" bolts shall be Grinnell Fig. 137, Elcen Fig. 68 or 68A, Fee & Mason Fig. 176, or equal.
10. Column type pipe supports shall consist of pipe columns of size required to carry the full pipe and standard cast iron bases and saddles as required. Saddles shall be of proper size to fit the pipe being supported.

PART 3 - EXECUTION

3.1 INSTALLATION OF PIPING

A. Materials shall be new and of the best grade and quality; workmanship shall be first class in every respect.

B. Each piece of iron pipe and each fitting shall be plainly marked at the foundry with class number and weight.

C. Where indicated on the Drawings, plain-end pipe shall be joined by means of flanged adapters or flexible couplings which shall be Rockwell, Dresser, or equal.

D. All pipe couplings shall be designed to safely withstand the operating pressure of the lines in which they are installed. All couplings shall be shop primed with an approved rust inhibitive primer.

E. Taps and connections to piping shall be made as required to connect equipment, sample lines, etc., and where otherwise shown on the Drawings.

F. Piping shall be installed straight and true, parallel or perpendicular to walls, with approved offsets around obstructions. Standard pipe fittings shall be used for changing direction of piping. No mitered joints or field fabricated pipe bends are permitted unless accepted by the Engineer.

G. All piping, fittings, valves and other accessories shall be thoroughly cleaned of dirt, chips and foreign matter before joint connections are made.

H. All plastic pipe shall be adequately supported and braced. Support spacing shall not exceed the recommendations of the Plastics Pipe Institute.

I. Teflon tape shall be used on all plastic pipe threaded connections.

J. Field cut male threads on plastic pipe shall be made with plastic pipe threading dies.

K. The annular space of plain wall sleeves shall be packed tight with lead wool to within 3/4 inch of wall face and then patch grouted flush to wall face with non-staining nonshrink grout, Masterflow 713 by Master Builders, Sonogrout by Sonneborn-Contech, or equal.

L. All pipe sleeves passing through walls or floors of chlorine feed and storage areas shall be provided with gas tight seals.

M. All pipe threads shall conform to ANSI B2.1.

N. Piping shall be erected to provide for expansion and contraction.

O. Screwed or soldered unions shall be provided in all small piping as required to permit convenient removal of equipment, valves and piping accessories from the piping system.

P. Dielectric insulating couplings or brass adapters shall be used whenever the adjoining materials being connected are of dissimilar material such as connections between copper tubing and steel pipe.

Q. All inside piping shall be color coded, stenciled and label tagged for identification as specified in Division 09.

END OF SECTION 462010

SECTION 462012 – INTERIOR PROCESS VALVES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment and services required to furnish and install all new valves as shown on the Drawings and/or specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Valves: Section 331216

B. Interior Process Piping: Section 462010

C. Valves furnished with equipment are included with equipment specifications.

1.3 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 013323.

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

2.1 CHECK VALVES

A. The valve is a counterweighted, rubber seated check valve with attached cushion chamber whose function is to permit flow in only one direction, close tightly when its discharge side pressure exceeds its inlet pressure, and to close without a slam or bang.

B. The swing check valve shall be constructed with heavy cast iron or cast steel body with a bronze or stainless steel seat ring, a non-corrosive shaft for attachment of weight and lever, and complete non-corrosive shockless chamber.

C. It shall absolutely prevent the return of water, oil or gas back through the valve when the inlet pressure decreases below the delivery pressure. The valve must be tight seating and must be shockless in operation. The seat ring must be renewable.

D. The cushion chamber shall be attached to the side of the valve body externally and so constructed with a piston operating in a chamber that will effectively permit the valve to be

operated without any hammering action. The shock absorption shall be by air, and the cushion chamber shall be so arranged that the closing speed will be adjustable to meet the service requirements.

E. The valve disc shall be of cast iron or cast steel and shall be suspended from a non-corrosive shaft which will pass through a stuffing box and be connected to the cushion chamber on the outside of the valve.

F. All material and workmanship shall be first class throughout and the purchaser reserves the right to inspect this valve before shipment.

G. It shall be ANSI/AWWA C508.

H. It shall be certified to NSF/ANSI/CAN 61

G. The valves will be Mueller A-2600 Swing Type Level and Weight Check Valve, or engineer approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All valves shall be installed in accordance with the manufacturer's recommendations.

END OF SECTION 462012

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DIVISION 01

GENERAL REQUIREMENTS

SECTION 012213 – BASIS OF MEASUREMENT AND PAYMENT - WATER AND SEWER

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. The Contractor shall furnish all necessary labor, machinery, tools, apparatus, equipment, materials, service, and other necessary supplies and perform all Work shown on the Drawings and/or described in the Specifications and Contract Documents at the unit prices as indicated by the Bidder in the Bid.

B. The Bidder declares that he has examined the site of the Work and informed himself fully in regard to all conditions pertaining to the place where the Work is to be done; that he has examined the Plans, Specification and Contract Documents for the Work, and has read all special provisions furnished prior to the opening of bids; and that he has further satisfied himself relative to the Work to be performed. The Bidder further declares that he understands that unit quantities shown in the Proposal are approximately only, are subject to increase or decrease, and that, should the quantities of any of the items be decreased, the Bidder will make no claim for the anticipated profits. In addition, the Owner also reserves the right to adjust quantities, either by addition or deletion and as-BID unit price shall remain in effect for these quantity adjustments.

C. All excavation required of the work shall be done as part of the total price for the complete project. **All excavation shall be <u>unclassified</u>**.

1.2 PAY ITEMS

A. The items listed hereinafter refer to and are the same items listed in the PROPOSAL hereinbefore and constitute all of the pay items in this Contract. Any other items of Work listed in the Specifications or shown on the Drawings shall be considered incidental to the above items.

1.3 WATER PIPE

A. Payment for water pipe shall be as described in the KYTC Standardized Water Bid Descriptions: Section 012213.10.

B. Installation of concrete thrust block shall be included as part of this pay item and considered incidental to the installation of the water pipe.

1.4 WATER VALVES

A. Payment for water valves shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10

1.5 WATER VALVES SPECIAL (INSERTING VALVES AND BOXES)

A. Payment for furnishing and installing inserting valves and boxes will be made at their respective contract unit price each, complete in place, which price includes compensation for furnishing and delivering all equipment and machinery to install insertion valve, excavation (including rock), exposing existing water main, installing tapping saddle and tapping cartridge on existing main, blocking, drilling and tapping existing live water main, dewatering, installation of insertion valve, backfilling, surface restoration (include concrete and asphalt pavement replacement), and all other installation requirements necessary to complete the insertion valve.

1.6 WATER FIRE HYDRANT ASSEMBLY

A. Payment for water fire hydrant assembly shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.7 WATER FIRE HYDRANT REMOVE

A. Payment for water fire hydrant assembly shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.8 WATER CAP EXISTING WATER MAIN

A. Payment for capping existing water main shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.9 WATER TAPPING SLEEVE AND VALVE

A. Payment for connections to existing water mains using a tapping sleeve and valve shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.10 WATER TIE-IN

A. Payment for connection to existing water mains shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.11 WATER METER RELOCATE

A. Payment for relocation of an existing service meter shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.12 WATER ENCASEMENT STEEL BORED

A. Payment for steel encasement bore shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.13 RAILROAD COORDINATION

A. Payment for rail road coordination will be made at the respective contract unit price lump sum, which price shall include compensation for coordinating the rail road flagger and inspector. The Owner has previously obtained the Liability Insurance policy and executed an Agreement with the CSX Railroad. The Contractor shall be responsible for coordinating the previously executed permits, insurance, and agreements that have been made available and are on the project site. The Contractor shall include in his bid price the cost for providing the CSX RailRoad flagger and CSX Inspector. Instructions can be found in the Rail Road Permit; Section 330523.10.

1.14 WATER SERVICE SHORT SIDE

A. Payment for customer service installation not crossing the centerline of a public roadway shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.15 WATER LINE MARKER

A. Payment for customer service installation not crossing the centerline of a public roadway shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.16 SAFELOADING

A. Payment for safeloading existing watermains that will remain abandoned piping under highway shall be made at their respective contract unit price cubic yard, which price includes compensation for furnishing and delivering all equipment and material to safeload the piping, excavation (including rock), exposing existing water main, backfilling, surface restoration (include concrete and asphalt pavement replacement), and all other installation requirements necessary to complete the safeloading.

1.17 SANITARY SEWER FORCE MAIN

A. Payment for sanitary sewer force main shall be as described in the KYTC Standardized Sanitary Sewer Bid Descriptions: Section 012213.20.

B. Installation of concrete thrust block shall be included as part of this pay item and considered incidental to the installation of the sanitary sewer force main.

1.18 SANITARY SEWER ENCASEMENT STEEL BORED

A. Payment for steel encasement bore shall be as described in the KYTC Standardized Sanitary Sewer Bid Descriptions; Section 012213.20.

1.19 SANITARY SEWER FORCE MAIN TIE-IN

A. Payment for connection to existing sanitary sewer force mains shall be as described in the KYTC Standardized Sanitary Sewer Bid Descriptions; Section 012213.20.

1.20 SANITARY SEWER MANHOLE TAP EXISTING

A. Payment for connection to existing sanitary sewer manhole shall be as described in the KYTC Standardized Sanitary Sewer Bid Descriptions; Section 012213.20.

1.21 SANITARY CAP EXISTING MAIN

A. Payment for capping existing forcemain shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10 for capping existing water main.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 012213

Standard Water Bid Item Descriptions

W AIR RELEASE VALVE This bid item description shall apply to all air release valve installations of every size except those defined as "Special". This item shall include the air release valve, main to valve connecting line or piping, manhole, vault, structure, access casting or doors, tapping the main, labor, equipment, excavation, proper backfill and restoration required to install the air release valve at the location shown on the plans or as directed in accordance with the specifications and standard drawings complete and ready for use. All air release/vacuum valves on a project shall be paid under one bid item regardless of size. No separate pay items will be established for size variations. Only in the case of the uniqueness of a particular air release valve would a separate bid item be established. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

BOLLARDS This item is for payment for furnishing and installing protective guard posts at above ground utility installations. A bollard may consist of, but not limited to, a steel post set in concrete or any other substantial post material. This item shall include all labor, equipment, and materials needed for complete installation of the bollard as specified by the utility owner specifications and plans. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

NOTE: A bid code for this item has been established in standard roadway bid items and shall be used for payment of this item. The bid code is 21341ND

W CAP EXISTING MAIN This item shall include the specified cap, concrete blocking and/or mechanical anchoring, labor, equipment, excavation, backfill, and restoration required to install the cap at the location shown on the plans or as directed in accordance with the specifications. This item is not to be paid on new main installations. This pay item is only to be paid to cap existing mains. Caps on new mains are incidental to the new main. Any and all caps on existing mains shall be paid under one bid item included in the contract regardless of size. No separate bid items will be established for size variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W DIRECTIONAL BORE Payment under this item is made whenever the plans or specifications specifically show directional boring is to be utilized in order to minimize the impact of open cut for the installation of water main under streets, creeks, and etc. Payment under this item shall include the specified bore pipe, labor, and equipment. No separate payment shall be made for bore pipe installed in the bore whether used as a carrier pipe or an encasement of a separate carrier pipe. This item shall also include pipe anchors at each end of the bore when specified to prevent the creep or contraction of the bore pipe. Carrier pipe installed within a bore pipe shall be paid separately under pipe items. Payment under this item shall not be size specific and no separate bid items will be established for size variations. The bore pipe sizes to be included under this item shall be as shown on the plans and/or in the specifications. Any and all directional bores in each contract shall be paid under one directional bore bid item included in the contract regardless of size. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

W ENCASEMENT CONCRETE Includes all labor, equipment, excavation, concrete, reinforcing steel, backfill, restoration, and etc., to construct the concrete encasement of the water main as shown on the plans, and in accordance with the specifications and standard drawings. Payment under this item shall be in addition to the carrier pipe as paid under separate bid items. Carrier pipe is not included in this bid item. Any and all concrete encasement shall be paid under one bid item included in the contract regardless of the size of the carrier pipe or the volume of concrete or steel reinforcement as specified in the plans and specifications. No separate bid items will be established for size variations. Measurement of pay quantity shall be from end of concrete to end of concrete. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

W ENCASEMENT STEEL BORED This item shall include the steel encasement pipe size as specified on the plans and in the specifications, casing spacers, end seals, labor, and equipment to bore and install the encasement in accordance with the plans and specifications, complete and ready for use. The size shall be the measured internal diameter of the encasement pipe. The sizes of encasement to be paid under the size ranges specified in the bid items shall be as follows:

Range 1 = All encasement sizes greater than 2 inches to and including 6 inches
Range 2 = All encasement sizes greater than 6 inches to and including 10 inches
Range 3 = All encasement sizes greater than 10 inches to and including 14 inches
Range 4 = All encasement sizes greater than 14 inches to and including 18 inches
Range 5 = All encasement sizes greater than 18 inches to and including 24 inches
Range 6 = All encasement sizes greater than 24 inches

(Encasement sizes of 2 inches internal diameter or less shall not be paid separately; but, shall be considered incidental to the carrier pipe.) Payment under this bid item shall not include the carrier pipe. Carrier pipe shall be paid under a separate bid item. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

W ENCASEMENT STEEL OPEN CUT This item shall include the steel encasement pipe size as specified on the plans and in the specifications, casing spacers, end seals, labor, and equipment to open cut and install the encasement in accordance with the plans and specifications, complete and ready for use. The size shall be the measured internal diameter of the encasement pipe. The size encasement to be paid under the size ranges specified in the bid items shall be as follows:

Range 1 = All encasement sizes greater than 2 inches to and including 6 inches
Range 2 = All encasement sizes greater than 6 inches to and including 10 inches
Range 3 = All encasement sizes greater than 10 inches to and including 14 inches
Range 4 = All encasement sizes greater than 14 inches to and including 18 inches
Range 5 = All encasement sizes greater than 18 inches to and including 24 inches
Range 6 = All encasement sizes greater than 24 inches

(Encasement sizes of 2 inches internal diameter or less shall not be paid separately; but, shall be considered incidental to the carrier pipe.) Payment under this bid item shall not include the carrier pipe. Carrier pipe shall be paid under a separate bid item. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

W FIRE HYDRANT ADJUST Includes all labor, equipment, excavation, materials, and backfill to adjust the existing fire hydrant using the fire hydrant manufacturer's extension kit for adjustments of 18" or less. Adjustments greater than 18" require anchoring couplings and vertical bends to adjust to grade. The Contractor will supply and install all anchor couplings, bends, fire hydrant extension, concrete blocking, restoration, granular drainage material, etc, needed to adjust the fire hydrant complete and ready for use as shown on the plans, and in accordance with the specifications and standard drawings. This also includes allowing for the utility owner inspector to inspect the existing fire hydrant prior to adjusting, contractor returning unusable fire hydrants to the utility owner warehouse and picking up a replacement hydrant. No additional payment will be made for rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete and ready for use.

W FIRE HYDRANT ASSEMBLY Includes all labor, equipment, new fire hydrant, isolating valve and valve box, concrete pad around valve box (when specified in specifications or plans), piping, anchoring tee, anchoring couplings, fire hydrant extension, excavation, concrete blocking, granular drainage material, backfill, and restoration, to install a new fire hydrant assembly as indicated on plans and on standard drawings compete and ready for use. No additional payment will be made for rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W FIRE HYDRANT RELOCATE This item includes all labor and equipment to remove the existing fire hydrant from its existing location and reinstalling at a new location. This item shall include a new isolating valve and valve box, concrete pad around valve box (when required in specifications or plans), new piping, new anchoring tee, anchoring couplings, fire hydrant extensions, concrete blocking, restoration, granular drainage material, excavation, and backfill as indicated on plans, specifications, and on standard drawings compete and ready for use. This item shall also include allowing for utility owner inspector to inspect the existing fire hydrant prior to reuse, contractor returning unusable fire hydrants to the utility owner warehouse and picking up a replacement hydrant for use, if the existing fire hydrant is determined unfit for reuse. No additional payment will be made for rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W FIRE HYDRANT REMOVE This bid item includes removal of an abandoned fire hydrant, isolating valve, and valve box to the satisfaction of the engineer. The removed fire hydrant, isolating valve and valve box shall become the property of the contractor for his disposal as salvage or scrap. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W FLUSH HYDRANT ASSEMBLY This item shall include the flushing hydrant assembly, service line, tapping the main, labor, equipment, excavation, backfill, and restoration required to install the flush hydrant at the location shown on the plans and in accordance with the specifications and standard drawings, complete and ready for use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W FLUSHING ASSEMBLY This item shall include the flushing device assembly, service line, meter box and lid, tapping the main, labor, equipment, excavation, backfill, and restoration required to install the

flushing device at the location shown on the plans and in accordance with the specifications and standard drawings, complete and ready for use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W LINE MARKER This item is for payment for furnishing and installing a ground level water utility line marker as specified by the utility owner specifications and plans. A line marker may consist of a post or monument of whatever materials specified and shall include markings and/or signage on same as specified by plans or specifications. This item shall include all labor, equipment, and materials needed for complete installation of the marker. This item shall be paid EACH (EA) when complete.

W MAIN POINT RELOCATE This item is intended for payment for horizontal and/or vertical relocation of a short length of an existing main at the locations shown on the plans. This bid item is to be used to relocate an existing water main at point locations such as to clear a conflict at a proposed drainage structure, pipe or any other similar short relocation situation, and where the existing pipe material is to be reused. The contractor shall provide any additional pipe or fitting material needed to complete the work as shown on the plans and specifications. The materials provided shall be of the same type and specification as those that exist. Substitution of alternative materials shall be approved by the engineer in advance on a case by case basis. New polyethylene wrap is to be provided (if wrap exists or is specified in the specifications to be used). If it is necessary that the pipe be disassembled for relay, payment under this item shall also include replacement of joint gaskets as needed. Bedding and backfill shall be provided and performed the same as with any other pipe installation as detailed in the plans and specifications. Payment under this item shall be for each location requiring an existing main to be relocated horizontally or vertically regardless of pipe size or relocation length. No separate pay items will be established for pipe size variations or relocation segment length variations. Water Main Relocate shall not be paid on a linear feet basis; but, shall be Paid EACH (EA) at each location when complete and placed in service. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced.

W METER This item is for payment for installation of all standard water meters of all sizes 2 inches ID or less as specified on the plans. This item shall include all labor, equipment, meter, meter box, casting, yoke, and any other associated material needed for installation of a functioning water meter in accordance with the plans and specifications, complete and ready for use. This item shall include connections to the new or existing water service line. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W METER ADJUST This item includes all labor, equipment, excavation, materials, backfill, restoration, and etc., to adjust the meter casting to finished grade (whatever size exists) at the location shown on the plans or as directed in accordance with the specifications and standard drawings complete and ready for use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W METER RELOCATE This item includes all labor, equipment, excavation, additional fittings, disinfection, testing, restoration, and etc., to relocate the existing water meter (whatever size exists), meter yoke, meter box, casting, and etc., from its old location to the location shown on the plans or as directed, in accordance with the specifications and standard drawings complete and ready for use. The new service pipe (if required) will be paid under short side or long side service bid items. Any and all meter

relocations of 2 inches or less shall be paid under one bid item included in the contract regardless of size. Each individual relocation shall be paid individually under this item; however, no separate bid items will be established for meter size variations of 2 inches ID or less. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W METER VAULT SIZE RANGE 1 OR 2 This item is for payment for installation of an underground structure for housing of a larger water meter, fittings, and valves as required by the plans and specifications. This item shall include all labor, equipment, excavation, concrete, manhole castings or access doors, the specified meter(s) valve(s), all piping, and fitting materials associated with installing a functioning meter and vault in accordance with the plans, standard drawings, and specifications, complete and ready for use. The size shall be the measured internal diameter of the meter and piping to be installed. The size meter vault to be paid under size 1 or 2 shall be as follows:

Size Range 1 = All meter and piping sizes greater than 2 inches up to and including 6 inches
Size Range 2 = All meter and piping sizes greater than 6 inches

This item shall be paid EACH (EA) when complete. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced.

W METER/FIRE SERVICE COMBO VAULT This item is for payment for installation of an underground structure for housing of a water meter and fire service piping, fittings, and valves as required by the plans and specifications. This item shall include all labor, equipment, excavation, concrete, manhole castings or access doors, the specified meter(s), valve(s), all piping, and fitting materials associated with installing a functioning meter and fire service vault in accordance with the plans and specifications, complete and ready for use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W METER WITH PRESSURE REDUCING VALVE (PRV) This item is for payment for installation of all standard water meters with pressure reducing valves (PRV) of all sizes 2 inches ID or less as specified on the plans. This item shall include all labor, equipment, meter, PRV, meter box, casting, yoke, and any other associated material needed for installation of a functioning water meter with PRV in accordance with the plans and specifications, complete and ready for use. This item shall include connections to the new or existing water service line. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W PIPE This description shall apply to all PVC, ductile iron, and polyethylene/plastic pipe bid items of every size and type to be used as water main, except those bid items defined as "Special". This item includes the pipe specified by the plans and specifications, all fittings (including, but not limited to, bends, tees, reducers, plugs, and caps), tracing wire with test boxes (if required by specification), polyethylene wrap (when specified), labor, equipment, excavation, bedding, restoration, testing, backfill, and etc., required to install the specified new pipe and new fittings at the locations shown on the plans, or as directed, in accordance with the specifications and standard drawings complete and ready for use. No additional payment will be made for rock excavation. This bid item includes material and placement of flowable fill under existing and proposed pavement, and wherever else specified on the plans or in the specifications. This item shall also include pipe anchors, at each end of polyethylene pipe runs when

specified to prevent the creep or contraction of the pipe. Measurement of quantities under this item shall be through fittings, encasements, and directional bores (only when a separate carrier pipe is specified within the directional bore pipe). Measurements shall be further defined to be to the center of tie-in where new pipe contacts existing pipe at the center of connecting fittings, to the outside face of vault or structure walls, or to the point of main termination at dead ends. No separate payment will be made under pipe items when the directional bore pipe is the carrier pipe. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

W PLUG EXISTING MAIN This item shall include the specified plug, concrete blocking and/or anchoring, labor, equipment, excavation, backfill, and restoration required to install the plug in an existing in-service main that is to remain at the location shown on the plans or as directed in accordance with the specifications. Any and all plugs on all existing in-service mains shall be paid under one bid item included in the contract regardless of size. No separate bid items will be established for size variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

NOTE: This utility bid item is not to be paid on new main installations or abandoned mains. This pay item is to plug existing in-service mains only. Plugs on new mains are incidental to the new main just like all other fittings.

NOTE: Plugging of existing abandon mains shall be performed and paid in accordance with Section 708.03.05 of KYTC Standard Specifications For Road And Bridge Construction and paid using Bid Code 01314 Plug Pipe.

W PRESSURE REDUCING VALVE This description shall apply to all pressure reducing valves (PRV) of every size required in the plans and specifications except those bid items defined as "Special". Payment under this description is to be for PRVs being installed with new main. This item includes the PRV as specified in the plans and specifications, polyethylene wrap (if required by specification), labor, equipment, excavation, anchoring (if any), pit or vault, backfill, restoration, testing, disinfection, and etc., required to install the specified PRV at the location shown on the plans in accordance with the specifications and standard drawings complete and ready for use. If required on plans and/or proposed adjoining DIP is restrained, PRVs shall be restrained. PRV restraint shall be considered incidental to the PRV and adjoining pipe. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W PUMP STATION This item is for payment for installation of pumps and an above or below ground structure for housing of the pumps. This item shall include all pumps, piping, fittings, valves, electrical components, building materials, concrete, any other appurtenances, labor, equipment, excavation, and backfill, to complete the pump station installation as required by the plans, standard drawings, and specifications, complete and ready for use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LUMP SUM (LS) when complete.

W REMOVE TRANSITE (AC) PIPE This item shall include all labor, equipment, and materials needed for removal and disposal of the pipe as hazardous material. All work shall be performed by trained and certified personnel in accordance with all environmental laws and regulations.
Any and all transite AC pipe removed shall be paid under one bid item included in the contract regardless

of size. No separate bid items will be established for size variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

W SERVICE LONG SIDE This bid item description shall apply to all service line installations of every size bid up to and including 2 inch inside diameter, except those service bid items defined as "Special". This item includes the specified piping material, main tap, tapping saddle (if required), and corporation stop materials, coupling for connecting the new piping to the surviving existing piping, encasement of 2 inches or less internal diameter (if required by plan or specification), labor, equipment, excavation, backfill, testing, disinfection, and restoration, at the locations shown on the plans or as directed, in accordance with the specifications and standard drawings, complete and ready for use. This bid item is to pay for service installations where the ends of the service connection are on opposite sides of the public roadway and the service line crosses the centerline of the public roadway as shown on the plans. The length of the service line is not to be specified. Payment under this item shall not be restricted by a minimum or maximum length. The contractor shall draw his own conclusions as to the length of piping that may be needed. Payment under this item shall include boring, jacking, or excavating across the public roadway for placement. Placement of a service across a private residential or commercial entrance alone shall not be reason to make payment under this item. Private or commercial entrances shall not be considered a public roadway in defining payment under this item. This pay item does not include installation or relocation of meters. Meters will be paid separately. No additional payment will be made for rock excavation or for special bedding required in rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W SERVICE SHORT SIDE This bid item description shall apply to all service line installations of every size up to and including 2 inch internal diameter, except those service bid items defined as "Special". This item includes installation of the specified piping material of the size specified on plans, encasement of 2 inches or less internal diameter (if required by plan or specification), main tap, tapping saddle (if required), corporation stop, coupling for connecting the new piping to the surviving existing piping, labor, equipment, excavation, backfill, testing, disinfection, and restoration, at the locations shown on the plans or as directed, in accordance with the specifications and standard drawings, complete and ready for use. This bid item is to pay for service installations were both ends of the service connection are on the same side of the public roadway, or when an existing service crossing a public roadway will remain and is being extended, reconnected, or relocated with all work on one side of the public roadway centerline as shown on the plans. The length of the service line is not to be specified and shall not be restricted to any minimum or maximum length. Payment shall be made under this item even if the service crosses a private residential or commercial entrance; but, not a public roadway.
Private or commercial entrances shall not be considered a public roadway in defining payment under this item. The contractor shall draw his own conclusions as to the length of piping that may be needed. This pay item does not include installation or relocation of meters. Meters will be paid separately. No additional payment will be made for rock excavation or for bedding required in rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W SERVICE RELOCATE This item is for the relocation of an existing water service line where a meter is not involved, and where an existing service line can easily be adjusted by excavating alongside and moving the line horizontally and/or vertically a short distance without cutting the service line to avoid conflicts with road construction. This item shall include excavation, labor, equipment, bedding, and

backfill to relocate the line in accordance with the plans and specifications complete and ready for use. Payment under this item shall be for each location requiring relocation. Payment shall be made under this item regardless of service size or relocation length. No separate pay items will be established for size or length variation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W STRUCTURE ABANDONMENT This item is to be used to pay for abandonment of larger above or below ground water structures such as meter vaults, fire pits, pump stations, tanks, and etc. Payment under this time shall not be limited to size or scope; however structures with connecting pipes of 2 inches or less shall not be paid under this item; but, shall be considered incidental to water construction, (i.e., abandonment of standard water meters up to and including 2 inches would not be paid under this item). Payment under this item shall include all labor, equipment, and compacted fill or flowable fill for abandonment of the structure in place and restoration complete. No separate bid items will be established for size or structure variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W STRUCTURE REMOVAL This item is to be used to pay for removal of larger above or below ground water structures such as meter vaults, fire pits, pump stations, tanks, and etc. Payment under this time shall not be limited to size or scope; however structures with connecting pipes of 2 inches or less shall not be paid under this item; but, shall be considered incidental to water construction, (i.e., removal of standard water meters up to and including 2 inches would not be paid under this item). Payment under this item shall include all labor, equipment, and compacted backfill for removal of the structure and restoration complete. No separate bid items will be established for size or structure variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W TAPPING SLEVE AND VALVE SIZE 1 OR 2 This item shall include the specified tapping sleeve, valve, valve box, concrete pad around valve box (when required in specifications or plans), labor, and equipment to install the specified tapping sleeve and valve, complete and ready for use in accordance with the plans and specifications. The size shall be the measured internal diameter of the live pipe to be tapped. The size tapping sleeve and valve to be paid under sizes 1 or 2 shall be as follows:

Size 1 = All live tapped main sizes up to and including 8 inches
Size 2 = All live tapped main sizes greater than 8 inches

Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W TIE-IN This bid description shall be used for all main tie-in bid items of every size except those defined as "Special". This item includes all labor, equipment, excavation, fittings, sleeves, reducers, couplings, blocking, anchoring, restoration, disinfection, testing and backfill required to make the water main tie-in as shown on the plans, and in accordance with the specifications complete and ready for use. Pipe for tie-ins shall be paid under separate bid items. This item shall be paid EACH (EA) when complete.

W VALVE This description shall apply to all valves of every size required in the plans and specifications

except those bid items defined as "Special". Payment under this description is to be for gate or butterfly valves being installed with new main. This item includes the valve as specified in the plans and specifications, polyethylene wrap (if required by specification), labor, equipment, excavation, anchoring (if any), valve box and valve stem extensions, backfill, concrete pad around valve box (if required by specification), restoration, testing, disinfection, and etc., required to install the specified valve at the location shown on the plans in accordance with the specifications and standard drawings complete and ready for use. If required on plans and/or proposed adjoining DIP is restrained, valves shall be restrained. Valve restraint shall be considered incidental to the valve and adjoining pipe. This description does not apply to cut-in valves. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W VALVE ANCHOR EXISTING This bid item is intended to pay for installation of restraint hardware on an existing valve where no restraint exists to hold the valve in place to facilitate tie-ins and other procedures where restraint is prudent. This work shall be performed in accordance with water specifications and plans. This bid item shall include all labor equipment, excavation, materials and backfill to complete restraint of the designated valve, regardless of size, at the location shown on the plans, complete and ready for use. Materials to be provided may include, but is not limited to, retainer glands, lugs, threaded rod, concrete, reinforcing steel or any other material needed to complete the restraint. Should the associated valve box require removal to complete the restraint, the contractor shall reinstall the existing valve box, the cost of which shall be considered incidental to this bid item. No separate bid items are being provided for size variations. All sizes shall be paid under one bid item. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W VALVE BOX ADJUST Includes all labor, equipment, valve box and valve stem extensions (if required), excavation, backfill, concrete pad around valve box (when specified in specifications or plans), restoration, and etc., to adjust the top of the box to finished grade complete and ready for use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W VALVE CUT-IN This bid description is for new cut-in valve installations of all sizes where installation is accomplished by cutting out a section of existing main. This item shall include cutting the existing pipe, supplying the specified valve, couplings or sleeves, valve box, concrete pad around valve box (when required in specifications or plans), labor, equipment, and materials to install the valve at the locations shown on the plans, or as directed by the engineer, complete and ready for use. Any pipe required for installation shall be cut from that pipe removed or supplied new by the contractor. No separate payment will be made for pipe required for cut-in valve installation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W VALVE VAULT This item is for payment for installation of an underground structure for housing of specific valve(s) as required by the plans and specifications. This item shall include all labor, equipment, excavation, concrete, manhole castings or doors, the specified valve(s), all piping, and fitting materials associated with installing a functioning valve vault in accordance with the plans, standard drawing, and specifications, complete and ready for use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

Standard Sanitary Sewer Bid Item Descriptions

S BYPASS PUMPING This item shall include all labor, equipment, and materials needed to complete a bypass pumping and/or hauling operation for diversion of sewage during sanitary sewer construction. Examples of such operations when bypass pumping and/or hauling may be necessary is during force main tie-ins, manhole invert reconstruction, insertion of new manholes into existing mains, or other similar construction. There may be more than one bypass pumping/hauling operation on a project. This item shall be paid for each separate bypass pumping/hauling operation occurrence as called out on the plans or directed by the engineer and actually performed. There will be no separate bid items defined for length, duration, or volume of sewage pumped or hauled in each occurrence. If a bypass pumping/hauling operation is called out on the plans; but, conditions are such that the bypass pumping/hauling operation is not needed or utilized, no payment will be made under this item. The contractor shall draw his own conclusions as to what labor, equipment, and materials may be needed for each bypass pumping/hauling occurrence. The contractor should be prepared to handle the maximum volume of the sewer being bypassed, even during a storm event. This item shall not be paid separately, but shall be considered incidental, when bypass pumping and/or hauling is needed during cast-in-place-pipe (CIPP) and/or point repair operations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA).

S CIPP LATERAL SERVICE INVSTIGATION This item shall include all equipment, materials, labor and incidentals necessary to enter the sewer in compliance with all safety/confided space requirements and perform the identification, assessment and pre-measurement of all existing and abandoned laterals for the placement of Cured-In-Place-Pipe lining. This item shall be in payment for all lateral service investigation for all sewer segments to be lined as a part of this contract. This bid item shall include bypass pumping when required. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. Payment for this item shall be LUMP SUM (LS).

S CIPP LATERAL REINSTATEMENT This item is to pay for installing a Cured-In-Place-Pipe liner in service laterals and service/mainline connections to stabilize structural defects and construction inadequacies. This bid item shall include all labor, equipment, materials and incidentals necessary to perform the service lateral reinstatement in accordance with the plans and specifications. Work under this item shall include sewer flow control, pre-installation cleaning, sealing connections to existing sewer main, pre- and post- construction CCTV inspection and final testing of the CIPP system. This item shall also include the "top hat" required by the specifications. All CIPP lateral reinstatements shall be paid under this item regardless of the size or length of reinstatement. No separate bid items of varying sizes or length of CIPP lateral reinstatement will be provided in the contract. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. Payment for this item shall be EACH (EA) for each CIPP lateral reinstatement complete and ready for use.

S CIPP LINER This bid Item is to pay for rehabilitation of existing sanitary sewers using the Cured-In-Place-Pipe method. This bid item description applies to all CIPP sizes included in the contract.

All CIPP Liner items of all varying sizes shall include all labor, materials, customer notification, testing, necessary permits, ingress and egress procedures, bypass pumping, pre- construction video, sediment and root removal, dewatering, traffic control, erosion and sediment control, excavation pits, removal and replacement of manhole frames and covers as necessary to facilitate the lining work, sealing at manholes and service connections, clearing and grubbing, pipeline cleaning, re-cleaning and video inspection as many times as necessary, debris collection and disposal, root removal, pre- and post-construction video inspection, all digital inspection footage, final report preparation and approval, the cost of potable water from the Owner, required compliance tests, site restoration, site cleanup, sealing of liner at manholes, acceptance testing and all other rehabilitation work and incidentals not included under other pay items necessary to complete the rehabilitation per the plans and specifications. There will be no separate payment for acceptance testing of the lined pipe; but shall be considered incidental to this item. Pay under this item shall be by each size bid in the contract. Pay measurement shall be from center of manhole to center of manhole. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF).

S CIPP PROTRUDING LATERAL REMOVAL This item includes all equipment, materials, labor and incidentals necessary to enter the sewer in compliance with all safety/confined space requirements, remove a sufficient amount of the protruding tap to insure a proper and safe Cured-In-Place-Pipe lining insertion and perform pre-installation CCTV. This bid item shall include bypass pumping when required. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. Payment for this item shall be EACH (EA) for each protruding lateral removed.

S CONCRETE PIPE ANCHOR This item shall be constructed on the sewer pipe at the locations shown on the plans in accordance with sanitary sewer specifications and standard drawings. Payment for concrete anchors will be made at the contract unit price each in place complete and ready for use. Each concrete anchor of sewer pipe or force main shall be paid under one bid item per contract regardless of the sizes of carrier pipe being anchored in the contract. No separate bid items will be established for size variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S DIRECTIONAL BORE Payment under this item is made whenever the plans or specifications specifically show directional boring is to be utilized in order to minimize the impact of open cut for the installation of force main or gravity sewer under streets, creeks, and etc. Payment under this item shall include the specified bore pipe, labor, and equipment. No separate payment shall be made for bore pipe installed in the bore whether used as a carrier pipe or an encasement of a separate carrier pipe. This item shall also include pipe anchors at each end of the bore when specified to prevent the creep or contraction of the bore pipe. Carrier pipe installed within a bore pipe shall be paid separately under pipe items. Payment under this item shall not be size specific and no separate bid items will be established for size variations. The bore pipe sizes to be included under this item shall be as shown on the plans and/or in the specifications. Any and all directional bores in each contract shall be paid under one directional bore bid item included in the contract regardless of size. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF).

S ENCASEMENT CONCRETE Includes all labor, equipment, excavation, concrete, reinforcing

steel, backfill, restoration, and etc., to construct the concrete encasement of the sewer or force main as shown on the plans, and in accordance with the specifications and standard drawings. Payment under this item shall be in addition to the carrier pipe as paid under separate bid items. Carrier pipe is not included in this bid item. Any and all concrete encasement shall be paid under one bid item included in the contract regardless of the size of the carrier pipe or the volume of concrete or steel reinforcement as specified in the plans and specifications. No separate bid items will be established for size variations. Measurement of pay quantity shall be from end of concrete to end of concrete. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

S ENCASEMENT STEEL BORED This item shall include the steel encasement pipe size as specified on the plans and in the specifications, casing spacers, end seals, labor, and equipment to bore and install the encasement in accordance with the plans and specifications, complete and ready for use. The size shall be the measured internal diameter of the encasement pipe. The sizes of encasement to be paid under the size ranges specified in the bid items shall be as follows:

Range 1 = All encasement sizes greater than 2 inches to and including 6 inches
Range 2 = All encasement sizes greater than 6 inches to and including 10 inches
Range 3 = All encasement sizes greater than 10 inches to and including 14 inches
Range 4 = All encasement sizes greater than 14 inches to and including 18 inches
Range 5 = All encasement sizes greater than 18 inches to and including 24 inches
Range 6 = All encasement sizes greater than 24 inches

(Encasement sizes of 2 inches internal diameter or less shall not be paid separately; but, shall be considered incidental to the carrier pipe.) Payment under this bid item shall not include the carrier pipe. Carrier pipe shall be paid under a separate bid item. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF).

S ENCASEMENT STEEL OPEN CUT This item shall include the steel encasement pipe size as specified on the plans and in the specifications, casing spacers, end seals, labor, and equipment to open cut install the encasement in accordance with the plans and specifications, complete and ready for use. The size shall be the measured internal diameter of the encasement pipe. The size encasement to be paid under the size ranges specified in the bid items shall be as follows:

Range 1 = All encasement sizes greater than 2 inches to and including 6 inches
Range 2 = All encasement sizes greater than 6 inches to and including 10 inches
Range 3 = All encasement sizes greater than 10 inches to and including 14 inches
Range 4 = All encasement sizes greater than 14 inches to and including 18 inches
Range 5 = All encasement sizes greater than 18 inches to and including 24 inches
Range 6 = All encasement sizes greater than 24 inches

(Encasement sizes of 2 inches internal diameter or less shall not be paid separately; but, shall be considered incidental to the carrier pipe.) Payment under this bid item shall not include the carrier pipe. Carrier pipe shall be paid under a separate bid item. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF).

S FORCE MAIN This description shall apply to all PVC and ductile iron and polyethylene/plastic pipe bid items of every size and type, except those bid items defined as "Special". This item includes the pipe specified by the plans and specifications, all fittings (including, but not limited to, bends, tees, reducers, plugs, and caps), tracing wire with test boxes (if required by specification), polyethylene wrap (when specified), labor, equipment, excavation, bedding, restoration, testing, backfill, and etc., required to install the specified new pipe and new fittings at the locations shown on the plans, or as directed, in accordance with the specifications and standard drawings complete and ready for use. No additional payment will be made for rock excavation. This bid item includes material and placement of flowable fill under existing and proposed pavement, and wherever else specified on the plans or in the specifications. This item shall also include pipe anchors on polyethylene pipe runs as shown on the plans or required by the specifications to prevent the creep or contraction of the pipe. Measurement of quantities under this item shall be through fittings, encasements, and directional bores (only when a separate carrier pipe is specified within the directional bore pipe). No separate payment will be made under pipe items when the directional bore pipe is the carrier pipe. Measurements shall be further defined to be to the center of tie-in where new pipe contacts existing pipe at the center of connecting fittings, to the outside face of vault or structure walls, or to the point of main termination at dead ends. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF).

S FORCE MAIN AIR RLS/VAC VLV This bid item description shall apply to all force main air release/vacuum valve installations of every size except those defined as "Special".
This item shall include the air release/vacuum valve, main to valve connecting line or piping, manhole/vault/structure, access casting or doors, tapping the main, labor, equipment, excavation, proper backfill and restoration required to install the air release/vacuum valve at the location shown on the plans or as directed in accordance with the specifications and standard drawings complete and ready for use. All air release/vacuum valves on a project shall be paid under one bid item regardless of size. No separate pay items will be established for size variations. Only in the case of the uniqueness of a particular air release/vacuum valve would a separate bid item be established. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S FORCE MAIN DIRECTIONAL BORE Payment under this item is made whenever the plans or specifications specifically show directional boring is to be utilized in order to minimize the impact of open cut for the installation of sewer or force main under streets, buildings, creeks, and etc. Payment under this item shall include the specified bore pipe, labor, and equipment. No separate payment shall be made for bore pipe installed in the bore whether used as a carrier pipe or an encasement of a separate carrier pipe. This item shall also include pipe anchors at each end of the bore when specified to prevent the creep or contraction of the bore pipe. Carrier pipe installed within a bore pipe shall be paid separately under pipe items. Payment under this item shall not be size specific and no separate bid items will be established for size variations. The bore pipe sizes to be included under this item shall be as shown on the plans and/or in the specifications. Any and all directional bores in each contract shall be paid under one directional bore bid item included in the contract regardless of size. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF).

S FORCE MAIN POINT RELOCATE This item is intended for payment for horizontal and/or vertical relocation of a short length of an existing main at the locations shown on the plans. This bid item is to be used to relocate an existing force main at point locations such as to clear a conflict at a

proposed drainage structure, pipe or any other similar short relocation situation, and where the existing pipe material is to be reused. The contractor shall provide any additional pipe or fitting material needed to complete the work as shown on the plans and specifications. The materials provided shall be of the same type and specification as those that exist. Substitution of alternative materials shall be approved by the engineer in advance on a case by case basis. New polyethylene wrap is to be provided (if wrap exists or is specified in the specifications to be used). If it is necessary that the pipe be disassembled for relay, payment under this item shall also include replacement of joint gaskets as needed. Bedding and backfill shall be provided and performed the same as with any other pipe installation as detailed in the plans and specifications. Payment under this item shall be for each location requiring an existing main to be relocated horizontally or vertically regardless of pipe size or relocation length. No separate pay items will be established for pipe size variations or relocation segment length variations. Force Main Relocate shall not be paid on a linear feet basis; but shall be shall be paid EACH (EA) at each location when complete and placed in service. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced.

S FORCE MAIN TAP SLEVE/VALVE RANGE 1 OR 2 This item shall include the specified tapping sleeve, valve, valve box, concrete pad around valve box (when required in specifications or plans), labor, and equipment to install the specified tapping sleeve and valve, complete and ready for use in accordance with the plans and specifications. The size shall be the measured internal diameter of the live pipe to be tapped. The size tapping sleeve and valve to be paid under sizes 1 or 2 shall be as follows:

Range 1 = All live tapped main sizes up to and including 8 inches
Range 2 = All live tapped main sizes greater than 8 inches

Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S FORCE MAIN TIE-IN This bid description shall be used for all force main tie-in bid items of every size except those defined as "Special". This item includes all labor, equipment, excavation, fittings, sleeves, reducers, couplings, blocking, anchoring, restoration, testing and backfill required to make the force main tie-in as shown on the plans and in accordance with the specifications complete and ready for use. This bid item shall include purge and sanitary disposal of any sewage from any abandoned segments of force main. Pipe for tie-ins shall be paid under separate bid items. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S FORCE MAIN VALVE This description shall apply to all force main valves of every size required in the plans and specifications, except those bid items defined as "Special". Payment under this description is to be for gate or butterfly force main valves being installed with new force main. This item includes the valve as specified in the plans and specifications, polyethylene wrap (if required by specification), labor, equipment, excavation, anchoring (if any), valve box and valve stem extensions, backfill, concrete pad around valve box (if required by specification), restoration, testing, and etc., required to install the specified valve at the location shown on the plans in accordance with the specifications and standard drawings complete and ready f o r use. If required on plans and/or proposed adjoining DIP is restrained, force main valves s h a l l be restrained. Force main valve restraint shall be considered incidental to the force main valve and adjoining pipe. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be

referenced. This item shall be paid EACH (EA) when complete.

S FORCE MAIN VALVE BOX ADJUST Includes all labor, equipment, valve box and valve stem extensions (if required), excavation, backfill, concrete pad around valve box (when specified in specifications or plans), restoration, and etc., to adjust the top of the force main valve box to finished grade complete and ready for use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S LATERAL CLEANOUT This item shall be for payment for installation of a cleanout in a service lateral line. This item shall include furnishing and installation of a tee, vertical pipe of whatever length required, and threaded cap. The cleanout shall extend from the lateral to final grade elevation. The size of the cleanout shall be equivalent to the size of the lateral. The cleanout materials shall meet the same specification as those for the lateral. The cleanout shall be installed at the locations shown on the plans or as directed by the engineer. Only one pay item shall be established for cleanout installation. No separate pay items shall be established for size or height variances. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S LATERAL LONG SIDE This bid item description shall apply to all service lateral installations of every size up to and including 6 inch internal diameter, except those lateral bid items defined as "Special". This item includes the specified piping material, main tap, bends, clean outs, labor, equipment, excavation, backfill, testing, and restoration, at the locations shown on the plans or as directed, in accordance with the specifications and standard drawings, complete and ready for use. This bid item is to pay for service lateral installations where the ends of the lateral connection are on opposite sides of the public roadway. The new lateral must cross the centerline of the public roadway to qualify for payment as a long side lateral. The length of the service lateral is not to be specified. Payment under this item shall not be restricted by a minimum or maximum length. The contractor shall draw his own conclusions as to the length of piping that may be needed. Payment under this item shall include boring, jacking, or excavating across the public roadway for placement. Placement of a service lateral across a private residential or commercial entrance alone shall not be reason to make payment under this item. Private or commercial entrances shall not be considered a public roadway in defining payment under this item. No additional payment will be made for rock excavation or for bedding required in rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S LATERAL SHORT SIDE This bid item description shall apply to all service lateral installations of every size up to and including 6 inch, except those lateral bid items defined as "Special". This item includes the specified piping material, main tap tee, bends, clean outs, labor, equipment, excavation, backfill, testing, and restoration, at the locations shown on the plans or as directed, in accordance with the specifications and standard drawings, complete and ready for use. This bid item is to pay for lateral installations where both ends of the lateral connection are on the same side of the public roadway, or when an existing lateral crossing a public roadway will remain and is being extended, reconnected, or relocated with all work on one side of the public roadway centerline as shown on the plans. The length of the service lateral is not to be specified and shall not be restricted to any minimum or maximum length. Payment shall be made under this item even if the lateral crosses a private residential or commercial entrance; but, not a public roadway. Private or commercial

entrances shall not be considered a public roadway in defining payment under this item. The contractor shall draw his own conclusions as to the length of piping that may be needed. No additional payment will be made for rock excavation or for bedding required in rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S LINE MARKER This item is for payment for furnishing and installing a ground level sewer utility line marker as specified by the utility owner specifications and plans. A line marker may consist of a post or monument of whatever materials specified and shall include markings and/or signage on same as specified by plans or specifications. This item shall include all labor, equipment, and materials needed for complete installation of the marker. This item shall be paid EACH (EA) when complete.

S MANHOLE Payment under this item is for the installation of new 4 foot interior diameter sanitary sewer manhole. Payment for manholes will be made at the contract unit price each in place complete and ready for use at the locations shown on plans in accordance with specifications and standard drawings. Manholes shall include concrete base, barrel sections, cone section or slab top, steps, excavation, backfilling, air testing, restoration, and cleanup in accordance with the specifications and standard drawings. All materials, except casting, shall be new and unused. An existing casting from an existing abandoned or removed manhole is to be reused and shall be considered incidental to this item. When a new casting is specified, or an existing casting is unavailable, it shall be paid as a separate bid item. Anchoring of casting, new or used, shall be considered incidental to this bid item. No additional compensation will be paid for manhole height variations. No additional payment will be made for rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S MANHOLE ABANDON/REMOVE Payment under this item is for the partial removal and/or filling of any sanitary sewer manhole regardless of size or depth that no longer serves any purpose. Payment shall be made regardless of whether the manhole is or is not in conflict with other work. Any manhole requiring partial removal, but not total removal, in order to clear a conflict with other work shall be paid under this item. All manholes partially removed shall be removed to a point at least one foot below final grade, one foot below roadway subgrade, or one foot clear of any other underground infrastructure, whichever is lowest. If partial removal of an abandoned manhole is elected by the contractor, the remaining manhole structure shall be refilled with flowable fill. Payment for disposal of a sanitary sewer manhole will be made under this item only. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S MANHOLE ADJUST TO GRADE Payment under this item is for the adjustment of sanitary sewer casting elevation on all sizes of existing sanitary manholes. This work shall be performed in accordance with the sanitary sewer specifications. Payment shall be made under this bid item regardless of the amount of adjustment necessary to a sanitary sewer manhole casting or diameter of the manhole. Work under this pay item may be as simple as placing a bed of mortar under a casting; but, shall also be inclusive of installation of adjusting rings, and /or addition, removal, or replacement of barrel sections. The existing casting is to be reused unless a new casting is specified on the plans. New casting, when specified, shall be paid as a separate bid item. Anchoring of the casting shall be incidental to this item. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA)

when complete.

S MANHOLE CASTING STANDARD Payment under this bid items is for furnishing of a new standard traffic baring casting for sanitary manholes meeting the requirements of the sanitary sewer specifications and standard drawings. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when installed.

S MANHOLE CASTING WATERTIGHT Payment under this bid item is for furnishing of a new watertight traffic baring casting for sanitary manholes meeting the requirements of the sanitary sewer specifications and standard drawings. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when installed.

S MANHOLE RECONSTRUCT INVERT This bid item is to pay for all labor, equipment, and material for rework of the manhole bench to redirect or eliminate flow, such as when the flow of a pipe or pipes are being removed or redirected. This work will be as specified in the plans, specifications, or directed by the engineer. This work may consist of, but is not limited to, removal of concrete and/or placement of concrete in elimination or redirect of flow. This item shall also include providing and placement of a rubber seal or boot as required by utility specification, standard drawing or plan. The contractor shall draw his own conclusions as to the effort and scope of work needed to comply with the specifications, standard drawings, and plans. No payment shall be made under this bid when MANHOLE TAP EXISTING, or MANHOLE TAP EXISTING ADD DROP are being paid at the same location, as this type of work is included in those items. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S MANHOLE TAP EXISTING This bid item is to pay for all labor, equipment, and material for coring one opening in an existing manhole base, addition of a rubber seal as specified, and rework of the manhole bench to direct the additional pipe flow. The bid item shall be paid for each core opening added to a single manhole. This bid item shall also include any rework of the existing manhole bench due to the elimination of other existing pipes and flow. This work will be as specified in the plans, specifications, or directed by the engineer. This work may consist of, but is not limited to, removal of concrete and/or placement of concrete in the addition, elimination, or redirect of flow. The contractor shall draw his own conclusions as to the effort and scope of work needed to comply with the specifications, standard drawings, and plans. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S MANHOLE TAP EXISTING ADD DROP This bid item is to pay for all labor, equipment, and material for coring one opening in an existing manhole base, addition of a rubber seal as specified, addition of a vertical drop pipe to the outside of the manhole, placement of reinforcing steel and concrete to encase vertical pipe, and rework of the manhole bench to direct the additional pipe flow. The bid item shall be paid for each drop added to a single manhole. This bid item shall also include any rework of the existing manhole bench due to the elimination of other existing pipes and flow. This work will be as specified in the plans, specifications, or directed by the engineer. This work may consist of, but is not limited to, removal of concrete and/or placement of concrete in the addition, elimination, or redirect of flow. The contractor shall draw his own conclusions as to the effort and

scope of work needed to comply with the specifications, standard drawings, and plans. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S MANHOLE WITH DROP Payment under this item is for the installation of new 4 foot interior diameter sanitary sewer manhole with drop. Payment for drop manholes will be made at the contract unit price each in place complete and ready for use at the locations shown on plans in accordance with specifications and standard drawings. Drop manholes shall include concrete base, barrel sections, drop materials, cone section or slab top, steps, excavation, backfilling, air testing, restoration, and cleanup. All materials, except casting, shall be new and unused. An existing casting from an existing abandoned or removed manhole is to be reused and shall be considered incidental to this item. When a new casting is specified, or an existing casting is unavailable, it shall be paid as a separate bid item. Anchoring of casting, new or used, shall be considered incidental to this bid item. No additional compensation will be paid for manhole height variations. No additional payment will be made for rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S MANHOLE WITH LINING Payment under this item is for the installation of new 4 foot interior diameter sanitary sewer manhole with corrosion resistant lining. Payment for manholes will be made at the contract unit price each in place complete and ready for use at the locations shown on plans in accordance with specifications and standard drawings. Manholes shall include concrete base, barrel sections, cone section or slab top, steps, lining, excavation, backfilling, air testing, restoration, and cleanup in accordance with the standard drawings. All materials, except casting, shall be new and unused. An existing casting from an existing abandoned or removed manhole is to be reused and shall be considered incidental to this item. When a new casting is specified, or an existing casting is unavailable, it shall be paid as a separate bid item. Anchoring of casting, new or used, shall be considered incidental to this bid item. No additional compensation will be paid for manhole height variations. No additional payment will be made for rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S MANHOLE WITH TRAP Payment under this item is for the installation of a new manhole with trap. Payment for trap manholes will be made at the contract unit price each in place complete and ready for use at the locations shown on plans in accordance with specifications and standard drawings. Trap manholes shall include concrete base, manhole structure and trap materials, cone section or slab top, steps, excavation, backfilling, air testing, restoration, and cleanup. All materials, except casting, shall be new and unused. An existing casting from an existing abandoned or removed manhole is to be reused and shall be considered incidental to this item. When a new casting is specified, or an existing casting is unavailable, it shall be paid as a separate bid item. Anchoring of casting, new or used, shall be considered incidental to this bid item. No additional compensation will be paid for manhole height variations. No additional payment will be made for rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S PIPE This description shall apply to all PVC and ductile iron gravity sewer pipe bid items of every size and type 8 inches internal diameter and larger, except those bid items defined as "Special". This item includes the pipe specified by the plans and specifications, all fittings (including, but not limited to,

tap tees and couplings for joining to existing similar or dissimilar pipes), polyethylene wrap (if required by specification), labor, equipment, excavation, bedding, restoration, pressure or vacuum testing, temporary testing materials, video inspection, backfill, and etc., required to install the specified new pipe and new fittings at the locations shown on the plans, or as directed, in accordance with the specifications and standard drawings complete and ready for use. This bid item shall include material and placement of flowable fill under existing and proposed pavement, and wherever specified on the plans or in the specifications. No additional payment will be made for rock excavation. Measurement of quantities under this item shall be through fittings and encasements to a point at the outside face of manhole barrels, or to the point of main termination at dead ends or lamp holes. Carrier pipe placed within an encasement shall be paid under this item and shall include casing spacers and end seals. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF).

S PIPE POINT REPAIR This item is to be used to pay for repair of short lengths of existing sanitary sewer pipe that, through prior video inspection or other means, are known to have pre- existing failure. Pipe Point Repair may be needed in preparation for installation of cured-in-place-pipe (CIPP) lining or other instances where failure is known and repair is prudent. The size of pipe shall not be defined in separate bid items. All diameter sizes of point repair shall be paid under this one item. The materials to be used to make the repair shall be as defined on the plans or in the specifications. This bid item shall include all excavation, pipe materials, joining materials to connect old and new pipe, bedding, and backfill to complete the repair at the locations shown on the plans or as directed by the engineer, complete and ready for use. This bid item shall include bypass pumping when required. Measurement shall be from contact point to contact point of old and new pipe. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF).

S PUMP STATION This item is for payment for installation of sanitary pump stations including above or below ground structure for housing of the pumps. This item shall include all pumps, piping, fittings, valves, electrical components, building materials, concrete, any other appurtenances, labor, equipment, excavation, and backfill, to complete the pump station installation as required by the plans, standard drawings, and specifications, complete and ready for use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LUMP SUM (LS) for each when complete.

S STRUCTURE ABANDON This item is to be used to pay for abandonment of larger above or below ground sewer structures such as air release/vacuum valve vaults, pump stations, tanks, etc. Payment under this time shall not be limited to size or scope; however structures with connecting pipes of 2 inches or less shall not be paid under this item; but, shall be considered incidental to sewer construction, (i.e., abandonment of standard air release/vacuum valves up to and including 2 inches would not be paid under this item). Payment under this item shall include all labor, equipment, and compacted fill or flowable fill for abandonment of the structure in place and restoration complete. No separate bid items will be established for size or structure variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

S STRUCTURE REMOVAL This item is to be used to pay for removal of larger above or below ground sewer structures such as air release/vacuum valve vaults, pump stations, tanks, and etc. Payment under this time shall not be limited to size or scope; however, structures with connecting pipes

of 2 inches or less shall not be paid under this item; but, shall be considered incidental to sewer construction, (i.e., removal of standard air release/vacuum valves and their structure up to and including 2 inches would not be paid under this item). Payment under this item shall include all labor, equipment, and compacted backfill for removal of the structure and restoration complete. No separate bid items will be established for size or structure variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

SECTION 013323 – SHOP DRAWINGS, PRODUCT DATA, SAMPLES, AND RFI'S

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. General: This section specifies procedural requirements for nonadministrative submittals including shop drawings, product data, samples (when samples are specifically requested), and other miscellaneous work-related submittals. Shop drawings, product data, samples, and other work-related submittals are required to amplify, expand and coordinate the information contained in the Contract Documents.

B. Refer to other Division-01 sections and other Contract Documents for Specifications on administrative, non-work-related submittals. Such submittals include, but are not limited to the following items:

1. Permits.
2. Payment applications.
3. Performance and payment bonds.
4. Insurance certificates.
5. Inspection and test reports.
6. Schedule of values.
7. Progress reports.
8. Listing of subcontractors.
9. Operating and Maintenance Manuals

C. Engineer prefers initial submittals be in electronic media along with one paper copy for review. Engineer utilizes Newforma software and will provide Contractor with the necessary links and instructions for submittal purposes. Upon completion of the review process, Contractor shall print 2 copies of complete submittal, including transmittal cover page and stamp page, and deliver to Engineer.

If Contractor does not have capability to submit electronic submittals, then Contractor shall submit a request to Engineer for waiver. In the event a waiver is granted, paper submittals shall be provided as directed by the Engineer.

D. Submittals shall be checked and reviewed by the Contractor and stamped with Contractor's review stamp before submission to the Engineer. The review of the submittals by the Engineer shall not be construed as a complete check but will indicate only that the general method of construction and detailing is satisfactory. Review of such submittals will not relieve the Contractor of the responsibility for any errors which may exist as the Contractor shall be responsible for the dimensions and design of adequate connections, details, and satisfactory construction of all work.

E. All Requests for Information (RFI) to Engineer shall be submitted electronically via Engineer's Newforma software.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-01 Specification sections, apply to work of this section.

1.3 DEFINITIONS

A. Shop drawings are technical drawings and data that have been specially prepared for this project, including but not limited to the following items:

1. Fabrication and installation drawings.
2. Setting diagrams.
3. Shop work manufacturing instructions.
4. Templates.
5. Patterns.
6. Coordination drawings (for use on-site).
7. Schedules.
8. Design mix formulas.
9. Contractor's engineering calculations.

Standard information prepared without specific reference to a project is not considered to be shop drawings.

B. Product data includes standard printed information on manufactured products that have not been specially-prepared for this project, including but not limited to the following items:

1. Manufacturer's product specifications and installation instructions.
2. Standard color charts.
3. Catalog cuts.
4. Roughing in diagrams and templates.
5. Standard wiring diagrams.
6. Printed performance curves.
7. Operational range diagrams.
8. Mill reports.
9. Standard product operating and maintenance manuals.

C. Samples, where specifically required, are physical examples of work, including but not limited to the following items:

1. Partial sections of manufactured or fabricated work.
2. Small cuts or containers of materials.
3. Complete units of repetitively-used materials.
4. Swatches showing color, texture, and pattern.
5. Color range sets.
6. Units of work to be used for independent inspection and testing.

D. Miscellaneous submittals are work-related, non-administrative submittals that do not fit in the three previous categories, including, but not limited to the following:

1. Specially-prepared and standard printed warranties.
2. Maintenance agreements.
3. Workmanship bonds.
4. Survey data and reports.
5. Testing and certification reports.
6. Record drawings.
7. Field measurement data.

1.4 SUBMITTAL PROCEDURES

A. General: Refer to the General Conditions and Paragraph 1.1 hereinbefore for basic requirements for submittal handling.

B. Coordination: Coordinate the preparation and processing of submittals with the performance of the work. Coordinate each separate submittal with other submittals and related activities such as testing, purchasing, fabrication, delivery, and similar activities that require sequential activity.

1. It is the Contractor's responsibility to make such field measurements as are needed to base submittals on actual field conditions to ensure proper connection, fit, function, and performance of all work and equipment in the execution of the contract work.
2. Coordinate the submittal of different units of interrelated work so that one submittal will not be delayed by the Architect/Engineer's need to review a related submittal. The Architect/Engineer reserves the right to withhold action on any submittal requiring coordination with other submittals until related submittals are forthcoming.

C. Coordination of Submittal Times: Prepare and transmit each submittal to the Architect/Engineer sufficiently in advance of the scheduled performance of related work and other applicable activities. Transmit different kinds of submittals for the same unit of work so that processing will not be delayed by the Architect/Engineer's need to review submittals concurrently for coordination.

D. Review Time: Allow sufficient time so that the installation will not be delayed as a result of the time required to properly process submittals, including time for resubmittal, if necessary. Advise the Architect/Engineer on each submittal, as to whether processing time is critical to the progress of the work and if the work would be expedited if processing time could be shortened.

1. Allow a longer time period where processing must be delayed for coordination with subsequent submittals. The Architect/Engineer will advise the Contractor promptly when it is determined that a submittal being processed must be delayed for coordination.
2. No extension of time will be authorized because of the Contractor's failure to transmit submittals to the Architect/Engineer sufficiently in advance of the work.

E. Submittal Preparation: Mark each submittal with a permanent label for identification. Provide the following information on the label for proper processing and recording of action taken.

1. Project name.
2. Date.
3. Name and address of Architect/Engineer.
4. Name and address of Contractor.
5. Name and address of subcontractor.

6. Name and address of supplier.
7. Name of manufacturer.
8. Number and title of appropriate specification section.
9. Drawing number and detail references, as appropriate.
10. Similar definitive information as necessary.

F. All submittals shall be referenced to the applicable item, section, and division of the Specifications, and to the applicable drawing(s) or drawing schedule(s). Include only one item in a submittal.

G. The Contractor shall review and check submittals and shall indicate his review by initials and date. Any submittal received without this evidence of review shall be returned to the Contractor without review.

H. If the submittals deviate from the Contract Drawings and/or Specifications, the Contractor shall advise the Engineer in writing of the deviation and the reasons therefore.

I. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the Architect/Engineer, and to other destinations as indicated, by use of a transmittal form. Submittals received from sources other than the Contractor will be returned to the sender "without action".

J. Electronic Submittals: If the electronic method of submittals is agreed to by Contractor, Engineer, and Owner, the format and procedures will be determined and implemented prior to any submittals. Submittals will be processed through "Newforma" software. Each item of the submittal documents shall be in .pdf format and shall be oriented so that they are read from upper left corner to lower right corner, with no rotation of said document being required after receiving it. The .pdf file shall be named so that it describes the item being submitted. All other requirements herein are part of the electronic submittal process with the exception of the duplicate copies. Contractor stamp indicating review and any comments or notes must be on the .pdf submittal.

1.5 SPECIFIC SUBMITTAL REQUIREMENTS

A. Shop drawings shall be prepared by a qualified detailer. Details shall be identified by reference to sheet and detail numbers shown on Contract Drawings. Where applicable, show fabrication, layout, setting, and erection details.

Shop drawings are defined as original drawings prepared by the Contractor, subcontractors, suppliers, or distributors performing work under this Contract. Shop drawings illustrate some portion of the work and show fabrication, layout, setting, or erection details of equipment, materials, and components. The Contractor shall, except as otherwise noted, have prepared the number of reviewed copies required for his distribution plus four (4) which will be retained by the Engineer. Shop drawings shall be folded to an approximate size of 8-1/2" x 11" and in such manner that the title block will be located in the lower right-hand corner of the exposed surface.

B. Project data shall include manufacturer's standard schematic drawings modified to delete information which is not applicable to the project and shall be supplemented to provide additional information applicable to the project. Each copy of descriptive literature shall be clearly marked to identify pertinent information as it applies to the project.

C. Where samples are required, they shall be adequate to illustrate materials, equipment or workmanship, and to establish standards by which completed work is judged. Provide sufficient size and quantity to clearly illustrate functional characteristics of product and material, with integrally related parts and attachment devices, along with a full range of color samples.

D. In the event the Engineer does not specifically reject the use of material or equipment at variance to that which is shown on the Drawings or specified, the Contractor shall, at no additional expense to the Owner, and using methods reviewed by the Engineer, make any changes to structures, piping, controls, electrical work, mechanical work, etc., that may be necessary to accommodate this equipment or material. Should equipment other than that on which design drawings are based be accepted by the Engineer, shop drawings shall be submitted detailing all modification work and equipment changes made necessary by the substituted item.

E. Additional information on particular items, such as special drawings, schedules, calculations, performance curves, and material details, shall be provided when specifically requested in the Technical Specifications.

F. Submittals for all electrically operated items (including instrumentation and controls) shall include complete size, color coding, all terminations and connections, and coordination with related equipment.

G. Equipment shop drawings shall indicate all factory or shop paint coatings applied by suppliers, manufacturers, and fabricators; the Contractor shall be responsible for ensuring the compatibility of such coatings with the field-applied paint products and systems.

H. Fastener specifications of manufacturer shall be indicated on equipment shop drawings.

I. Where manufacturers brand names are given in the Specifications for building and construction materials and products, such as grout, bonding compounds, curing compounds, masonry cleaners, waterproofing solutions, and similar products, the Contractor shall submit names and descriptive literature of such materials and products he proposes to use in this Contract.

J. No material shall be fabricated or shipped unless the applicable drawings or submittals have been reviewed by the Engineer and returned to the Contractor.

K. All bulletins, brochures, instructions, parts lists, and warranty packages with accompanying materials and products delivered to and installed in the project shall be saved and transmitted to the Owner through the Engineer.

1.6 REVIEW STATUS

A. Submittals will be returned, stamped with the following classifications: "Reviewed", "Furnish as Corrected", "Revise and Resubmit", "Rejected", or "Submit Specified Item".

B. In some instances, corrections to dimensions or clarification notations will be required, in which case the drawings will be marked "Furnish as Corrected." These shop drawings will not be required to be resubmitted for further approval. If the supplier makes additional modifications after receiving a "Furnish as Corrected" disposition, the drawings must then be resubmitted for review.

C. If the shop drawing is returned with the notation "Revise and Resubmit", the Contractor shall promptly make the revisions indicated and repeat the submittal approval procedure.

D. If the shop drawing is returned with the notation "Submit Specified Item", this indicates that the submittal does not meet the specification, will not be reviewed, and is unacceptable. Upon return of a drawing so marked, the Contractor shall repeat the initial approval procedure, submitting acceptable materials or equipment.

E. The "Rejected" notation is used to indicate materials or equipment that are not acceptable and are not included in the project.

1.7 REMINDER OF CONTRACTOR RESPONSIBILITIES

A. Verify field measurements, field construction criteria, catalog numbers, and similar data.

B. Coordinate each submittal with requirements of work and of Contract Documents.

C. Notify Engineer, in writing at time of submission, of deviations in submittals from requirements of Contract Documents.

D. Begin no work, and have no material or products fabricated or shipped which requires submittals until return of submittals with Engineer's stamp and initials or signature indicating review.

E. Upon review and close-out of a submittal, Contractor shall print two (2) copies of complete submittal, including transmittal cover page and stamp page, and deliver to Engineer.

F. It is emphasized that the review of shop drawings by the Engineer is for general conformance to the Contract Drawings and Specifications, but subject to the detailed requirements of the Contract Drawings and Specifications. Although the Engineer may check submitted data in more or less detail, such checking is an effort to discover errors and omissions in the Contractor's drawings and to assist the Contractor in coordinating and expediting his work, but shall in no way relieve the Contractor of his obligation and responsibility to properly coordinate the work, and to Engineer the details of the work in such a manner, that the purpose and intent of the Contract will be achieved nor shall any such detailed checking by the Engineer be construed as placing on him or on the Owner, any responsibility for the accuracy, proper fit, functioning or performance of any phase of the work included in this Contract. The Contractor is responsible for confirmation and correlation of dimensions at the job site; for information that pertains solely to the fabrication processes or to the techniques of construction; for the coordination of the work of all trades; and for performance of his work in a safe and satisfactory manner.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 013323

SECTION 014500 – QUALITY CONTROL SERVICES - LINE PROJECT

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. Required inspection and testing services are intended to assist in the determination of probable compliance of the Work with requirements specified or indicated. These required services do not relieve the Contractor of responsibility for compliance with these requirements or for compliance with requirements of the Contract Documents.

B. 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.

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

D. 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 or tests to be conducted at the field shall be done in the presence of the Engineer or his representative.

E. Certifications by independent testing laboratories may be by copy of the attest 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.

F. Inspections, tests, and related actions specified in this section and elsewhere in the Contract Documents are not intended to limit the Contractor's own quality control procedures which facilitate overall compliance with requirements of the Contract Documents.

1.2 RELATED DOCUMENTS

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

1.3 SUBMITTALS

A. General: Refer to Section 013323 for the general requirements on submittals. Submit a certified written report of each inspection, test, or similar service, directly to the Architect/Engineer.

B. Report Data: Written reports of each inspection, test, or similar service shall include, but not be limited to the following:

1. Name of testing agency or test laboratory.
2. Dates and locations of samples and tests or inspections.
3. Names of individuals making the inspection or test.
4. Designation of the work and test method.
5. Complete inspection or test data.

6. Test results.
7. Interpretations of test results.
8. Notation of significant ambient conditions at the time of sample-taking and testing.
9. Comments or professional opinions as to whether inspected or tested work complies with requirements of the Contract Documents.
10. Recommendations on retesting, if applicable.

1.4 RESPONSIBILITIES

A. Contractor Responsibilities: Except where they are specifically indicated as being the Owner's responsibility, or where they are to be provided by another identified entity, inspections, tests, and similar quality control services are the Contractor's responsibility; these services also include those specified to be performed by an independent agency and not directly by the Contractor. Costs for these services shall be included in the Contract Sum. The Contractor shall employ and pay an independent agency, testing laboratory, or other qualified firm to perform quality control services specified.

B. Retest Responsibility: Where results of required inspections, tests, or similar services prove unsatisfactory and do not indicate compliance of related Work with the requirements of the Contract Documents, then retests are the responsibility of the Contractor, regardless of whether the original test was the Contractor's responsibility. Retesting of work revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original Work.

C. Responsibility for Associated Services: The Contractor is required to cooperate with the independent performing required inspections, tests, and similar services. Provide such auxiliary services as are reasonably requested. Notify the testing agency sufficiently in advance of operations to permit assignment of personnel. These auxiliary services include but are not necessarily limited to the following:

1. Providing access to the work.
2. Taking samples or assistance with taking samples.
3. Delivery of Samples to test laboratories.
4. Delivery and protection of samples and test equipment at the project site.

D. Coordination: The Contractor and each independent agency engaged to perform inspections, tests, and similar services for the project shall coordinate the sequence of their activities so as to accommodate required services with a minimum of delay in the progress of the Work. In addition, the Contractor and each independent testing agency shall coordinate their Work so as to avoid the necessity of removing and replacing Work to accommodate inspections and tests. The Contractor is responsible for scheduling times for inspections, tests, taking of samples, and similar activities.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. Upon completion of inspection, testing, sample taking, and similar services performed on the Work, repair damaged work and restore substrates and finishes to eliminate deficiencies, including deficiencies in the visual qualities of exposed finishes. Comply with the Contract Document requirements for "Cutting and Patching". Protect Work exposed by or for quality control service activities, and protect repaired work. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

END OF SECTION 014500

SECTION 017400 – CLEANING

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. Maintain premises free from accumulations of waste, debris, and rubbish.

B. At completion of work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all exposed surfaces. Leave project clean and ready for occupancy.

1.2 RELATED DOCUMENTS

A.	Cutting and Patching	Section 017329.
B.	Project Closeout:	Section 017700.
C.	Cleaning for Specific Products of Work:	Specification Section for that work.

1.3 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 violative noxious substances.

B. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

1. Do not burn or bury rubbish and waste materials on project site.
2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
3. Do not dispose of wastes into streams or waterways.

PART 2 - PRODUCTS

2.1 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

3.1 DURING CONSTRUCTION

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

B. Wet down dry materials and rubbish to lay dust and prevent 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 Owner's property.

F. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.

G. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.

3.2 FINAL CLEANING

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

B. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.

C. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials, from sight-exposed interior or exterior finished surfaces; polish surfaces so designated to shine finish.

D. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.

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

F. Maintain cleaning until project, or portion thereof, is occupied by Owner.

END OF SECTION 017400

SECTION 017700 – PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

A. Liquidated Damages: Supplemental General Conditions

B. Project Record Documents: Section 017839.

1.2 SUBSTANTIAL COMPLETION

A. In order to initiate project closeout procedures, the Contractor shall submit the following:

1. Written certification to Engineer that project is Substantially Complete.
2. List of major items to be completed or corrected.

B. Engineer will make an inspection within 7 days after receipt of certification, together with Owner's Representative.

C. Should Engineer consider that work is Substantially Complete:

1. Contractor shall prepare, and submit to Engineer, a list of items to be completed or corrected, as determined by the inspection.
2. Engineer will prepare and issue a Certificate of Substantial Completion, containing:

a. Date of Substantial Completion.
b. Contractor's list of items to be completed or corrected, verified, and amended by Engineer.
c. The time within which Contractor shall complete or correct work of listed items.
d. Time and date Owner will assume possession of work or designated portion thereof.
e. Responsibilities of Owner and Contractor for:

1) Insurance
2) Utilities
3) Operation of Mechanical, Electrical, and Other Systems.
4) Maintenance and Cleaning.
5) Security.

f. Signatures of:

1) Engineer
2) Contractor
3) Owner

3. Owner occupancy of Project or Designated Portion of Project:

   a. Contractor shall:

      1) Obtain certificate of occupancy.
      2) Perform final cleaning in accordance with Section 017400.

   b. Owner will occupy Project, under provisions stated in Certificates of Substantial Completion.

4. Contractor: Complete work listed for completion or correction, within designated time.

D. Should Engineer consider that work is not Substantially Complete:

1. He shall immediately notify Contractor, in writing, stating reasons.
2. Contractor: Complete work, and send second written Engineer, certifying that Project, or designated portion of Project, is substantially complete.
3. Engineer will reinspect work.

E. Should Engineer consider that work is still not finally complete:

1. He shall notify Contractor, in writing, stating reasons.
2. Contractor shall take immediate steps to remedy the stated deficiencies, and send third written notice to the Engineer certifying that the work is complete.
3. Engineer and Owner will reinspect work at Contractor's expense.

1.3 FINAL INSPECTION

A. Contractor shall submit written certification that:

1. Contract Documents have been reviewed.
2. Project has been inspected for compliance with Contract Documents.
3. Work has been completed in accordance with Contract Documents.
4. Equipment and systems have been tested in presence of Owner's Representative and are operational.
5. Project is completed, and ready for final inspection.

B. Engineer will make final inspection within 7 days after receipt of certification.

C. Should Engineer consider that work is finally complete in accordance with requirements of Contract Documents, he shall request Contractor to make Project Closeout submittals.

D. Should Engineer consider that work is not finally complete:

1. He shall notify Contractor in writing, stating reasons.
2. Contractor shall take immediate steps to remedy the stated deficiencies, and send second written notice to Engineer certifying that work is complete.
3. Engineer will reinspect work.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: To requirements of Section 017839.

B. Guarantees, Warranties, and Bonds: To requirements of particular technical Specifications and Section 017834.

1.5 INSTRUCTION

A. Instruct Owner's personnel in operation of all systems, mechanical, electrical, and other equipment.

1.6 FINAL APPLICATION FOR PAYMENT

A. Contractor shall submit final applications in accordance with requirements of General Conditions.

1.7 FINAL CERTIFICATE FOR PAYMENT

A. Engineer will issue final certificate in accordance with provisions of general conditions.

B. Should final completion be materially delayed through no fault of Contractor, Engineer may issue a Semi-Final Certificate for Payment.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 017700

SECTION 017834 – WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. Compile specified warranties and bonds.

B. Compile specified service and maintenance contracts.

C. Co-execute submittals when so specified.

D. Review submittals to verify compliance with Contract Documents.

E. Submit to Engineer for review and transmittal to Owner. **Comply with provisions of Section 013323.**

1.2 RELATED DOCUMENTS

A. Bid Bond: Instructions to Bidders.

B. Performance and Payment Bonds: General Conditions and Supplemental General Conditions.

C. Guaranty: General Conditions and Supplemental General Conditions.

D. General Warranty of Construction: General Conditions.

E. Project Closeout: Section 017700.

F. Warranties and Bonds required for specific products: As listed in technical specifications in these Contract Documents herein.

G. Provisions of Warranties and Bonds, Duration: Respective specification sections for particular products.

1.3 SUBMITTALS REQUIREMENTS

A. Assemble warranties, bonds, and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.

B. Furnish two (2) original signed copies.

C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.

1. Product, equipment, or work item.

2. Firm name, address, and telephone number.
3. Scope
4. Date of beginning of warranty, bond, or service and maintenance contract.
5. Duration of warranty, bond, or service and maintenance contract.
6. Provide information for Owner's personnel:

    a. Proper procedure in case of failure.
    b. Instances that might affect the validity of warranty or bond.

7. Contractor name, address, and telephone number.

1.4 FORM OF SUBMITTALS

A. Prepare in duplicate packets.

B. Format:

1. Size 8-1/2 inch x 11 inch punch sheets for 3-ring binder.

    a. Fold larger sheets to fit into binders.

2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS." List:

    a. Title of Project
    b. Name of Contractor

C. Binders: Commercial quality, three-ring, with durable and cleanable plastic covers.

1.5 TIME OF SUBMITTALS

A. For equipment or component parts of equipment put into service during progress of construction:

1. Submit documents within 10 days after inspection and acceptance.

B. Otherwise make submittals within 10 days after date of substantial completion, prior to final request for payment.

C. For items of work, where acceptance is delayed materially beyond the Date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing the date of acceptance as the start of the warranty period.

1.6 SUBMITTALS REQUIRED

A. Submit warranties, bonds, service, and maintenance contracts as specified in the respective sections of the Specifications.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 017834

SECTION 017839 – PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 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.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Shop Drawings, Product Data, and Samples: Section 013323.

1.3 MARKING DEVICES

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

1.4 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. Coordinate and confirm with Engineer that electronic versions of all shop drawings have been provided to Engineer.

1.5 SUBMITTALS

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.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 017839

DIVISION 02

EXISTING CONDITIONS

SECTION 024100 – DEMOLITION & SALVAGE

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment and services required for demolition as shown on the Drawings and specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork: Section 312000

1.3 PROCEDURE

A. The procedures proposed for the accomplishment of salvage and demolition work shall be submitted for review. The procedures shall provide for safe conduct of the work, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress and timely disconnection of utility services. The procedures shall include a detailed description of the methods and equipment to be used for each operation and the sequence of operations.

B. It is the responsibility of the Contractor to visit the site to familiarize himself with the amount of Work that is included under this Section.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 DUST CONTROL

A. The amount of dust resulting from the demolition shall be controlled to prevent the spread of dust to occupied portions of the plant and to avoid creation of a nuisance in the surrounding area. Use of water will not be permitted when it will result in, or create hazardous or objectionable conditions such as ice, flooding and pollution.

3.2 DISCONNECTION OF UTILITY SERVICES

A. Utilities shall be disconnected at the points indicated by the Owner or Engineer and left in a safe condition.

3.3 BURNING

A. The use of burning at the project site for the disposal of refuse and debris will not be permitted unless authorized in writing by the Owner.

3.4 PROTECTION OF EXISTING WORK

A. Existing work to remain shall be protected from damage. Work damaged by the Contractor shall be repaired to match existing work.

3.5 BACKFILL OF STRUCTURES

A. All existing structures to be abandoned shall have equipment removed and walls demolished a minimum of two feet below finish grade. The portion of the demolished structures remaining below grade shall be backfilled with concrete, masonry, etc., from the demolition or any backfill material which is acceptable to the Engineer. The top 2 feet of the backfill shall be made up of topsoil and graded to match the existing ground. It shall be free of any demolition material. The entire backfill shall be compacted in such a manner as to prevent settlement.

B. All existing demolished basins shall have some method of positive drainage through the bottom slab as approved by the Engineer.

C. It is the responsibility of the Contractor to dispose of all excess demolition material from the site as soon as practicable.

3.6 SALVAGE MATERIAL

A. All equipment, pumps, controls, valves, piping, etc., is the property of the Owner and care shall be taken in its removal so not to damage it in any way. Such salvage material shall be removed and delivered to the Owner to a site designated by him. The Owner has the right to refuse any salvage material, and in such cases, it is the responsibility of the Contractor to dispose of the unwanted material.

END OF SECTION 024100

DIVISION 03

CONCRETE

SECTION 033000 – CAST-IN-PLACE CONCRETE

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment and services required to furnish and install all cast-in-place concrete as indicated on the Drawings and specified herein.

B. All concrete construction shall conform to all applicable requirements of ACI 301 (latest), Specifications for Structural Concrete for Buildings, except as modified by the supplemental requirements specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork: Section 312000

1.3 SUBMITTALS

The Contractor shall submit the following data for Engineer's review in accordance with Section 013323.

A. Concrete mixture proportions, test results and curves plotted to establish water-cementitious materials ratio if ACI 301-05 Section 4.2.3.4.b is followed.

B. Proposed mix designs and all necessary substantiating data used to establish the proposed mix designs if ACI 301-05 Section 4.2.3.1 is followed.

C. Mix designs shall be submitted for all mixes proposed or required to be used, including all mixes containing admixtures.

D. A certified copy of the control records of the proposed production facility establishing the standard deviation as defined in Paragraph 4.2.3.2. of ACI 301.

E. Submit shop drawings as specified in ACI 301. Submit shop drawing showing the location of proposed construction and control joints separate from the steel reinforcement shop drawings.

1. Construction Joints
2. Control Joints
3. Steel Reinforcement

1.4 QUALITY ASSURANCE

The Contractor shall obtain and have available in the field office at all times, the following references:

A. ACI 301 Specifications for Structural Concrete for Buildings ACI 301 (latest Revision).

B. SP-15 (05) Field Reference Manual: Specifications for Structural Concrete for Buildings with selected ACI references.

Available from:

The American Concrete Institute
Publications Department
P.O. Box 9094
Farmington Hills, Michigan 48333-9094

C. Manual of Standard Practice - CRSI. (Latest Edition).

D. Placing Reinforcing Bars - CRSI (Latest Edition).

Available from:

Concrete Reinforcing Steel Institute
933 North Plum Grove Road
Schaumburg, Illinois 60173-4758

E. ACI 318-08 Building Code Requirements for Structural Concrete and Commentary.

F. ACI 347 Guide to Form Work for Concrete.

PART 2 - PRODUCTS

2.1 CLASSES OF CONCRETE AND USAGE

A. Structural concrete of the various classes required shall be proportioned by either Method 1 or Method 2 of ACI 301 to produce the following 28-day compressive strengths:

1. Selection of Proportions for Class A Concrete:

   a. 4,500 psi compressive for strength at 28 days.
   b. Type II cement plus supplementary cementitious materials.
   c. Max. water-cementitious materials ratio = 0.45.
   d. Min. cement content = 584 lbs.
   e. Nominal max. size coarse aggregate = No. 67 (3/4" max.) or No. 57 (1" max.). Walls with architectural treatment shall use No. 67 (3/4" max.).
   f. Air content = 6percent plus or minus 1percent by volume.
   g. Slump = 3" - 4" when tested in accordance with ASTM C 143/C 143M. Slump shall not exceed 8 inches when high-range water-reducers are used.

2. Selection of Proportions for Class B Concrete:

   a. 3,000 psi compressive strength at 28 days.
   b. Type I cement plus supplementary cementitious materials.
   c. Max. water-cementitious materials ratio = 0.45.
   d. Min. cement content = 470 lbs. (5.0 bags)/cu. yd. concrete.
   e. Nominal max. size coarse aggregate = No. 67 (3/4" max.) or No. 57 (1" max). Walls with architectural treatment shall use No. 67 (3/4" max.).
   f. Air content = 6 percent plus or minus 1 percent by volume.

g. Slump = 3" - 4" when tested in accordance with ASTM C 143/C 143M. Slump shall not exceed 8 inches when high-range water-reducers are used.

B. Concrete shall be used as follows:

1. Class A concrete for all concrete work except as noted below.
2. Class B concrete for fill concrete, thrust blocks and topping over hollow-core slabs, and where indicated on the Drawings.

C. Type II cement conforming to ASTM C 150 shall be used in all structural concrete. Cement for exposed to view concrete shall have a uniform color classification.

D. Coarse aggregate for concrete shall be size No. 57, as specified in ASTM C 33 unless a smaller size aggregate is required to conform to provisions of Section 4.2.2.3 of ACI 301. Coarse aggregate shall conform to all requirements of ASTM C 33.

E. Manufactured sand shall not be used as fine aggregate in concrete.

2.2 ADMIXTURES

A. An air entraining admixture shall be used on all concrete exposed to freezing and thawing cycles. Product shall be MB-AE 90, MB-VR or Micro Air by BASF Construction Chemicals or approved equal. Certification attesting to the percent of effective solids and compliance of the material with ASTM C 260 shall be furnished, if requested.

B. Water-Reducing Admixture shall conform to ASTM C 494/C 494M Type A. Product shall be “Pozzolith” Series or “PolyHeed” Series by BASF Construction Chemicals or approved equal.

C. High-Range Water-Reducing Admixture shall conform to ASTM C 494/C 494M Type F. Product shall be Rheobuild 1000, “Glenium” Series or PS 1466 by BASF Construction Chemicals or approved equal.

D. Accelerating Admixture shall conform to ASTM C 494/C 494M Type C or E. Products shall be Pozzolith NC 534 or Pozzutec 20+ by BASF Construction Chemicals or approved equal.

E. Retarding Admixture shall conform to ASTM C 494/C 494M Type B or D. Product shall be “Pozzolith” Series or “DELVO” Series by BASF Construction Chemicals.

F. A water-reducing, set controlling admixture (nonlignin type) shall be used in all concrete. The admixture shall be a combination of polyhydroxylated polymers including catalysts and components to produce the required setting time based on job site conditions, specified early strength development, finishing characteristics required, and surface texture, as determined by the Engineer.

G. Certification shall be furnished attesting that the admixture exceeds the physical requirements of ASTM C 494, Type A, water-reducing and normal setting admixture, and when required, for ASTM C 494, Type D, water-reducing and retarding admixture when used with local materials with which the subject concrete is composed.

H. The admixture manufacturer, when requested, shall provide a qualified concrete technician employed by the manufacturer to assist in proportioning concrete for optimum use. He shall also be available when requested to advise on proper addition of the admixture to the concrete and on adjustment of the concrete mix proportions to meet changing job conditions.

I. The use of admixtures to retard setting of the concrete during hot weather, to accelerate setting during cold weather, and to reduce water content without impairing workability will be permitted if the following conditions are met:

J. The admixture shall conform to ASTM C494, except that the durability factor for concrete containing the admixture shall be at least 100 percent of control, the water content a maximum of 90 percent of control and length change shall not be greater than control, as defined in ASTM C 494.

K. Where the Contractor finds it impractical to employ fully the recommended procedures for hot weather concreting, the Engineer may at his discretion, require the use of a set retarding admixture for mass concrete 2.5 feet or more thick for all concrete whenever the temperature at the time concrete is cast exceeds 80°F. The admixture shall be selected by the Contractor subject to the review of the Engineer. The admixture and concrete containing the admixture shall meet all the requirements of these Specifications. Preliminary tests of this concrete shall be required at the Contractor's expense.

L. When more than 1 admixture is used, all admixtures shall be compatible. They should preferably be by the same manufacturer.

M. Calcium chloride will not be permitted as an admixture in any concrete.

2.3 REINFORCEMENT

A. The minimum yield strength of the reinforcement shall be 60,000 pounds per square inch. Bar reinforcement shall conform to the requirements of ASTM A 615/A 615M. All bar reinforcement shall be deformed.

B. Wire-mesh reinforcement shall be continuous between expansion joints. Laps shall be at least one full mesh plus 2 inches, staggered to avoid continuous lap in either direction and securely wired or clipped with standard clips.

C. Smooth dowels shall be plain steel bars conforming to ASTM A 615/A615M, Grade 60, or steel pipe conforming to ASTM A 120, Schedule 80. Pipe, if used, shall be closed flush at each end with mortar or metal or plastic cap. Dowels shall be installed at right angles to construction joints and expansion joints. Dowels shall be accurately aligned parallel to the finished surface and shall be rigidly held in place and supported during placing of the concrete. One end of the dowels shall be oiled or greased or dowels shall be coated with high-density polyethylene with a minimum thickness of 14 mils.

D. Reinforcement supports and other accessories in contact with the forms for members which will be exposed to view in the finished work shall be of stainless steel or shall have approved high-density polyethylene tips so that the metal portion shall be at least one-quarter of an inch from the form or surface. Supports for reinforcement, when in contact with the ground or stone fill, shall be precast stone concrete blocks. Particular attention is directed to the requirement of

Paragraph 3.3.2.4 of ACI Standard 301. These requirements apply to all reinforcement, whether in walls or other vertical elements, inclined elements or flatwork.

E. Particular care shall be taken to bend tie wire ends away from exposed faces of beams, slabs and columns. In no case shall ends of tie wires project toward or touch formwork.

2.4 OTHER MATERIALS

A. Anchorage items shall be of standard manufacture and of type required to engage with the anchors to be installed therein under other sections of the Specifications and shall be subject to approval by the Engineer.

1. Slots shall be galvanized dovetail-type as specified in Section "Masonry Work".
2. Inserts shall be malleable iron or steel, and of sturdy design adequate strength for the load to be carried. All inserts shall be galvanized. Adjustable wedge inserts shall have an integral loop or strap at the back or shall be slotted to receive a special-headed bolt not smaller than 5/8-inch in diameter and of the required length and fitted with hexagonal nut. Other inserts shall be either threaded or slotted as required by their usage. Threaded inserts shall have integral lugs to prevent running.
3. Concrete anchors shall be an approved expansion type conforming to Federal Specification FF-S-325, Groups I, II, III, or VIII and shall be installed in strict accordance with the manufacturer's recommendations. Material for anchors shall be as specified in Section 05500 "Miscellaneous Metals". Anchors shall develop ultimate shear and pull-out loads of not less than the following values in Class A concrete:

Bolt Diameter (Inches)	Min. Shear (Pounds)	Min. Pull-Out Load (Pounds)
2	4,500	4,600
5/8	6,900	7,700
3/4	10,500	9,900

B. Epoxy bonding adhesive used to bond fresh plastic concrete to sound, hardened concrete shall meet the following Specification. Contractor shall furnish a notarized certification by the manufacturer that the proposed material meets the Specification.

1. Material:

The epoxy material shall consist of a 2-component system whose components conform to the following requirements:

a. Component A - Component A shall be a modified epoxy resin of the epichlorohydrin bisphenol A condensation type, containing suitable viscosity control agents and having an epoxide equivalent of 180-200.
b. Component B - The B component shall be primarily a reaction product of one mole of an aliphatic polyamine and two moles of mono-functional epoxide containing compounds modified with 2, 4, 6 tri (dimethylaminomethyl) phenol.
c. The component ratio of B to A by volume shall be as specified by the manufacturer.

2. Properties of Mixed Components:

a.	Solids Content	100 percent by weight
b.	Pot Life	25-35 min. @ 73°F.
c.	Tack-Free Time	4-5-1/2 hrs @ (Thin Film) 73°F.
d.	Final Cure ASTM D 695	3 days at 73°F. (75percent ultimate strength)
e.	Initial Viscosity (A+B)	2,000 cps. min at 73°F.
f.	Color Mixed	Straw

3. Properties of Cured Material (Neat Material):

a.	Tensile Strength ASTM D 638	3,000 psi min. @ 14 days 73°F. cure
b.	Tensile Elongation ASTM D 638	2 - 2 percent at 14 modified days 73°F. cure
c.	Compressive Strength ASTM D 695	12,500 psi min. at 73° F. cure
d.	Compressive Modules ASTM D 695	470,000 psi min. @ 28 days, 73°F cure
e.	Compressive Strength ASTM D 695	5,500 psi min. @ 24 days 73°F cure
f.	Water Pick-up ASTM D 570	1.5 max.

C. Premolded expansion-joint filler strips shall conform to ASTM D 1752 and shall be 3/8-inch thick unless otherwise shown.

D. Joint sealants shall conform to ANSI A 116.1. The following joint sealants are acceptable:

1. Colma by Sika Chemical Corporation
2. Hornflex by A.C. Horn, Inc.
3. Sonolastic by BASF Construction Chemicals.

E. Nonshrink grout shall be Embeco 885 grout by BASF Construction Chemicals, Euco Firmix grout by the Euclid Chemical Company, or approved equal. The approved product shall be delivered to the site of the Work in the original sealed containers, each bearing the trade name of the material and the name of the manufacturer.

F. Hardeners and dustproofers shall be colorless, aqueous solution of zinc or magnesium fluosilicate. Each gallon of solution used for the first application shall contain not less than one pound of crystals. Each gallon of solution used for subsequent application shall contain not less than two pounds of crystals. Materials shall be reviewed by the Engineer. Product shall be Lapidolith by BASF Construction Chemicals or approved equal.

G. Porous fill shall be crushed rock or gravel of such size that all will pass a 1-1/2-inch screen, and not more than 5 percent will pass a No. 4 screen, free from earth clay or other foreign substances.

H. Waterstops: Waterstops shall be polyvinyl chloride, flat dumbbell shape (no center bulb), of size shown on Drawings, complete with fittings as required such as unions, vertical tees, vertical ells, flat crosses, flat ells, flat tees, etc. Waterstops shall be securely wired into place to

maintain proper position during placement of fresh concrete, as shown on the Drawings. Care shall be taken in the installation of the waterstop and the placing of the concrete to avoid "folding" while concrete is being placed, and to prevent voids in the concrete surrounding the waterstop.

I. Form Liners: Form liners for construction of fluted wall treatment shall be prefabricated plastic liners as manufactured by Greenstreak Plastic Products, Interform Company, or Symons Corporation.

1. Liners shall be fiberglass or ABS (acrylonitrile - butadiene - styrene) of such configuration as to obtain the fluted pattern shown or indicated on the Drawings.
2. For purposes of designating type and quality of material required, form liners shall be pattern 361 trapezoidal liners as manufactured by Greenstreak Plastic Products.
3. Preparation of forming materials, sealing of joints to prevent grout leakage and form release treatment (if required) shall be in strict compliance with the manufacturer's printed instructions and recommendations.

PART 3 - EXECUTION

3.1 FINISHES

A. Exposed to Public View Concrete Surfaces:

1. All concrete exposed to view in the completed structure shall be produced using materials and workmanship to such quality that only nominal finishing will be required. The provisions of paragraphs 6.2.2.1 and 6.3.6 of ACI 301 shall apply to all exterior exposed to public view concrete surfaces, including the outside surfaces of tanks.
2. Forms for exposed concrete surfaces shall be exterior grade, high-density overlay plywood, steel, or wood forms with smooth tempered hardboard form-liners.
3. Forms shall be coated with an approved release agent before initial pour and between subsequent pours, in accordance with the manufacturer's printed instructions. Form boards shall not be wet prior to placing concrete.
4. Recessed joints in concrete shall be formed using lacquer-coated wood battens or forms, milled to indicated profiles. Battens and corner strips shall be carefully inspected before concrete is placed and damaged pieces replaced.
5. Chamfer strips shall be one (1) inch radius with leg, polyvinyl chloride strips by Gateway Building Products, Saf-T-Grip Specialties Corp., Vinylex Corp., or equal.
6. Form panels shall be provided in the maximum sized practicable in order to minimize form joints. Wherever practicable, form joints shall occur at recessed joints. All form joints in exterior exposed to view surfaces shall be carefully caulked with an approved nonstaining caulking compound. Joints shall not be taped. Form oil or other material which will impart a stain to the concrete shall not be allowed to contact concrete surfaces.
7. Care shall be taken to prevent chipping of corners or other damage to concrete when forms are removed. Exposed corners and other surfaces which may be damaged by ensuing operations shall be protected from damage by boxing, corner boards or other approved means until construction is completed.
8. Form ties shall remain in the walls and shall be equipped with a water seal to prevent passage of water through the walls. Minimum set back of form ties shall be 1-1/2 inches from faces of wall. The hole left by removal of tie ends shall be sealed and grouted in

accordance with the procedure described hereinafter in Par. 3.01.F. Form ties will be permitted to fall within as-cast areas of architecturally treated wall surfaces; this does not apply to walls receiving decorative waterproof masonry coating.

9. All formed exposed to view concrete surfaces shall have a "smooth rubbed finish". Exterior vertical surfaces shall be rubbed to one foot below grade. Interior exposed to public view vertical surfaces of liquid containers shall be rubbed to 1 foot below the minimum liquid level that will occur during normal operations.

B. All vertical surfaces in liquid containing structures shall have a "smooth form" finish.

1. All "smooth form" concrete vertical surfaces shall be a true plane within 1/4 inch in 10 feet as determined by a 10-foot straightedge placed anywhere on the surface in any direction. Abrupt irregularities shall not exceed 1/8 inch.

C. Basin, flume, conduit and tank floors shall have a "troweled" finish unless shown otherwise on Drawings.

D. Weirs and overflow surfaces shall be given a "troweled" finish.

E. Exterior platforms, steps and landings, shall be given a "broom" finish. "Broom" finish shall be applied to surfaces which have been steel-troweled to an even, smooth finish. The troweled surface shall then be broomed with a fiber-bristle brush in the direction transverse to that of the main traffic.

F. Patching of holes due to removal of tie ends and other repairable defective areas, shall be as follows: Entire contact area of hole shall be coated with two-part moisture insensitive epoxy bonding compound as specified in Par. 2.04.B. in accordance with manufacturer's specifications, and prior to placing of freshly mixed patching mortar. Parching mortar shall be mixed and placed in general accordance with ACI 301, Par. 5.3.7.5.

G. For floors and slabs in which drains occur, special care shall be exercised to slope the floors uniformly to the drains. All floors with drains shall be sloped not less than 1/8 inch per foot unless otherwise shown. In all areas where quarry tile or other materials requiring more than 1/4 inch drop are to be overlaid, the concrete base slab shall be depressed to provide a finished floor at the same elevation as surrounding areas.

3.2 TESTING

A. All testing shall be in accordance with provisions of ACI 301. Testing services listed in ACI Sections 1.6.4 shall be performed by a testing agency acceptable to the Engineer and Owner.

B. The testing services of ACI sections 1.6.4.2 and 1.6.4.3 shall be performed at the Contractor’s expense. The Owner-approved third-party testing agency shall be responsible for making concrete test cylinders, storing and protecting concrete cylinders and delivering cylinders to the Owner-approved testing laboratory.

C. Testing services of ACI Section 1.6.4.4 shall be paid for by the Contractor. Test shall be made for every 50 cubic yards of concrete and/or each day concrete is placed.

3.3 ADDITIONAL REQUIREMENTS

A. Unless otherwise directed by the Engineer, the vertical surfaces of footings shall be formed. Excavations and reinforcement for all footings shall have been inspected by the Engineer before any concrete is placed.

B. The installation of underground and embedded items shall be inspected before slabs are placed. Pipes and conduits shall be installed below the concrete unless otherwise indicated. Fill required to raise the subgrade shall be placed as specified in Section 312000 "Earthwork". Porous fill not less than 6 inches in compacted thickness shall be installed under all slabs, tank bottoms, and foundations. The fill shall be leveled and uniformly compacted to a reasonably true and even surface. The surfaces shall be clean, free from frost, ice, mud and water. Waterproof paper, polyethylene sheeting of nominal 4-mil minimum thickness, or polyethylene-coated burlap shall be laid over all surfaces receiving concrete.

C. Concrete shall be placed in layers not over 18 inches deep and each layer shall be compacted by mechanical internal-vibrating equipment supplemented by hand spading, rodding and tamping as directed. Vibrators shall not be inserted into lower courses that have begun to set.

D. Concrete Mixing

1. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M and furnish batch ticket information.

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

2. Project site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

    a. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at lease 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
    b. For mixer capacity larger than 1 cu. Yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd.
    c. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

E. If concrete is placed by pumping, no aluminum shall be used in any parts of the pumping system which contact or might contaminate the concrete. Aluminum chutes and conveyors shall not be used.

F. All concrete surfaces shall be moist cured by the application of absorptive mats or double thicknesses of fabric kept continuously wet. Forms shall be kept continuously wet. Use of other curing methods will not be permitted unless written authorization is received from the Engineer.

G. The unit of operation shall not exceed 30 feet for tank walls and walls exposed to weather, and 45 feet for other work in any horizontal direction and not less than 48 hours shall elapse between casting of adjoining units unless these requirements are waived by the Engineer. Provision shall be made for jointing successive units as indicated or required to be made at spacing of approximately 25 feet. Additional construction joints required to satisfy the 25-foot spacing shall be located by the Contractor subject to the review of the Engineer. The Contractor shall submit for review drawings separate from the steel reinforcing drawings, showing the location of all proposed construction joints. All construction joints shall be prepared for bonding by roughening the surface of the concrete in an acceptable manner which will expose the aggregate uniformly and will not leave laitance, loosened particles of aggregate or damaged concrete at the surface. Joints in walls and columns shall be maintained level. Concrete shall be placed in layers not over 18 inches deep and each layer shall be compacted by mechanical internal-vibrating equipment supplemented by hand spading, rodding and tamping as directed. Vibrators shall not be inserted into lower courses that have begun to set.

H. Formwork for beam soffits and slabs and other parts that support the weight of concrete, shall remain in place until the concrete has reached its specified 28-day strength, unless otherwise specified or permitted.

I. Concrete Walks and Curbs:

1. Subgrade shall be true and well compacted at the required grades. Spongy and otherwise unsuitable material shall have been removed and replaced with approved material. Concrete walks shall be placed upon porous fill covered with waterproof paper, polyethylene sheeting of nominal 4-mil minimum thickness or polyethylene-coated burlap.
2. Concrete walks shall be not less than 4 inches in thickness. Walks shall have contraction joints every 5 linear feet in each groove in the top surface of the slab to a depth of at least one-fourth the slab thickness with a jointing tool. Transverse expansion joints shall be installed at all returns, driveways, and opposite expansion joints in adjacent curbs. Where curbs are not adjacent, transverse expansion joints shall be installed at intervals of approximately forty (40) feet. Sidewalks shall receive a "broomed" finish. Scoring shall be in a transverse direction. Edges of the sidewalks and joints shall be edged with a tool having a radius not greater than 1/6 inch. Sidewalks adjacent to curbs shall have a slope of 1/4 inch per foot toward the curb. Sidewalks not adjacent to curbs shall have a slope of 1/4 inch per foot. The surface of the concrete shall show no variation in cross section in excess of 1/4 inch in 5 feet. Concrete walks shall be reinforced with 6 x 6-W1.4xW1.4 welded wire reinforcement.
3. Concrete curbs shall be constructed to the section indicated on the Standard Detail, and all horizontal and vertical curves shall be incorporated as indicated or required. Forms shall be steel as approved by the Engineer. At the option of the Contractor, the curbs may be precast or cast-in-place. Cast-in-place curbs shall be divided into sections 8 to 10 feet in length using steel divider plates. The divider plates shall extend completely through the concrete and shall be removed. Precast curbs shall be cast in lengths of 4 to 5 feet. All exposed surfaces of concrete shall be finished smooth. All sharp edges and the edges of joints and divisions shall be tooled to 1/4-inch radius. Steel reinforcement shall be installed where the curb crosses pipe trenches or other insecure foundations. Such reinforcement shall consist of two (2) No. 4 deformed bars near the bottom of the curb and shall extend at least 24 inches beyond the insecure area. Transverse expansion joints shall be installed at all curb returns and at intervals of approximately 40 feet.

J. Column base plates, bearing plates for beams and similar structural members, machinery and equipment bases shall, after being plumbed and properly positioned, be provided with full bearing with nonshrink grout. Concrete surfaces shall be rough, clean, free of oil, grease, and laitance and shall be moistened thoroughly immediately before grout is placed. Metal surfaces shall be clean and free of oil, grease and rust. Mixing and placing shall be in conformance with the material manufacturer's printed instructions. After the grout has set, exposed surfaces shall be cut back one (1) inch and covered with a parge coat of mortar consisting of one (1) part Portland cement, two (2) parts sand and sufficient water to make the mixture placeable. Parge coat shall have a smooth dense finish. Exposed surfaces of grout and parge coat shall be water cured with wet burlap for seven (7) days.

K. Grout fill which is formed in place by using rotating equipment as a screen, such as clarifiers and similar types of equipment, shall be mixed in proportions and consistencies as required by the manufacturer or supplier of the equipment.

L. Watertightness:

1. The structures which are intended to contain liquids and/or will be subjected to exterior hydrostatic pressures shall be so constructed that, when completed and tested, there shall be no loss of water, and no wet spots shall show.
2. As soon as practicable, after the completion of the structures, the Contractor shall fill them with water and if leakages develop or wet spots show, the Contractor shall empty such structures and correct the leakage in an approved manner. Any cracks which appear in the concrete shall be dug out and suitably repaired. Temporary bulkheads over pipe openings in walls shall be provided as required for the testing.
3. After repairs, if any are required, the structures shall be tested again and further repaired, if necessary, until satisfactory results are obtained. All work in connection with these tests and repairs shall be at the expense of the Contractor.
4. Waterstops shall be placed in other locations as indicated on the Drawings and as may be required to assure the watertightness of all containers of liquids. Special shop-fabricated ells, tees and crosses shall be provided at junctions. Waterstops shall be extended at least 6 inches beyond end of placement in order to provide splice length for subsequent placement. In slabs and tank bottoms, water stops shall be turned up to be made continuous with waterstops at bottom of walls or in walls.
5. Joints between pipe (except cast iron wall pipe) and cast-in-place concrete walls shall be sealed by means of a groove cast completely around the pipe; the groove shall be filled with a quick setting hydraulic compound similar and equal to “Master Seal 590” as made by BASF Construction Chemicals mixed and applied in accordance with the manufacturer's instructions.

M. Unless otherwise shown or directed, all pumps, other equipment, and items such as lockers, motor control centers and the like, shall be installed on concrete bases. The bases shall be constructed to the dimensions shown on the plans or as required to meet plan elevations. Where no specific plan elevations are required, the bases shall be 6 inches thick and shall extend 3 inches outside the metal equipment base. In general, the concrete bases shall be placed up to 2 inches below the metal base. The equipment shall then be properly shimmied to grade and the 2- inch void filled with nonshrink grout.

N. Concrete which, in the opinion of the Architect-Engineer, has excessive honeycomb, aggregate pockets or depressions will be rejected and the Contractor shall, at his own expense, remove the entire section containing such defects and replace it with acceptable concrete.

O. Manhole or access steps shall be plastic, constructed of copolymer polypropylene meeting the requirements of ASTM D 2146 for Type II, Grade 16906 material. Step shall be reinforced with ASTM A 615, Grade 60, #4 deformed steel reinforcing bar, be 9" deep, 14" wide, provided with notched tread ridge, foot retainer lugs on each side of tread and penetration stops for press fit installation. Plastic steps shall be PS2-PF as manufactured by M.A. Industries, Inc., Peachtree City, Georgia. Steps shall be installed by drilling 1" diameter holes, minimum 3-3/4 inches deep into the wall, and then driving steps into hole to the penetration stop, resulting in a press fit condition.

P. Tank pressure relief valves shall be 6-inch diameter Neenah Foundry Company R-5001-1, American Valve & Hydrant B315.1, or equal, floor type, with outside hooks or inside self-contained lock; quantity and spacing as shown on structural drawings. No part of pressure relief valves shall project above the neat line of the tank floor to prevent fouling of scraper mechanisms where used.

Q. All existing contact surfaces with new patch shall be coated with moisture insensitive epoxy bonding adhesive, Sikadur Hi-Mod, Concresive LPL Liquid by BASF Construction Chemicals, or approved equal. Patch shall consist of base pour of 4,000 psi structural concrete, then a topping of non-shrink natural aggregate grout, Masterflow 713, Sonogrout by BASF Construction Chemicals, or approved equal, mixed and placed in accordance with manufacturer's instructions, to the thicknesses shown on Drawings. Coat base pour with epoxy bonding adhesive prior to placing grout course.

END OF SECTION 033000

DIVISION 31

EARTHWORK

SECTION 312000 – EARTHWORK

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all materials, labor, equipment, and services necessary to do all clearing and grubbing, excavation, backfilling, providing of additional fill material and topsoil, control of surface drainage and groundwater, finished site grading, and erosion control required to construct the work as shown.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. State and local code requirements shall control the disposal of trees and shrubs.

B. All burning shall be controlled by applicable local regulations.

C. Excavation Support and Protection - Section 315000

D. Erosion and Sedimentation Control- Section 312500

1.3 JOB CONDITIONS

A. Weather: Earthwork operations shall be suspended at any time when satisfactory results cannot be obtained on account of rain, snow, ice, drought, or other adverse weather conditions.

B. Existing Utilities: Prior to commencement of work, the Contractor shall locate existing underground utilities in areas of the work. If utilities are to remain in place, provide adequate means of protection during earthwork operations.

C. Use of Explosives: The Contractor (or any of his Subcontractors) shall not bring explosives onto site or use in work without prior written permission from the Owner. All activities involving explosives shall be in compliance with the rules and regulations of the State Department of Mines, and Minerals, Division of Explosives and Blasting. Contractor is solely responsible for handling, storage, and use of explosive materials when their use is permitted.

D. Protection of Persons and Property:

1. Barricade open excavations occurring as part of this work and post with warning lights.

    a. Operate warning lights as recommended by authorities having jurisdiction.
    b. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

E. Dust Control: Use all means necessary to control dust on or near the project site where such dust is caused by the Contractor's operations or directly results from conditions left by the Contractor.

1.4 UTILITY LINE ACTIVITIES COVERED UNDER NATIONWIDE PERMIT # 12

All activities involving utility line construction covered under NATIONWIDE PERMIT # 12 shall meet the following conditions:

A. The general Water Quality Certification is limited to the crossing of intermittent and perennial streams by utility lines.

B. The construction of permanent or temporary access roads will impact less than 300 linear feet of intermittent and perennial streams and less than one acre of jurisdictional wetlands.

C. Utility lines shall be located at least 50 feet away from a stream which appears as a blue line on a USGA 7-1/2 minute topographic map except where the utility line alignment crosses the stream. Utility lines that cross streams shall be constructed by methods that maintain normal streamflow and allow for a dry excavation. Water pumped from the excavation shall be contained and allowed to settle prior to re-entering the stream. Excavation equipment and vehicles shall operate outside of the flowing portion of the stream. Spoil material from the utility line excavation shall not be allowed to enter the flowing portion of the stream.

D. The activities shall not result in any permanent changes in preconstruction elevation contours in waters or wetlands or stream dimension, pattern, or profile.

E. Utility line construction projects through jurisdictional wetlands shall not result in conversion of the area to non-wetland status.

F. Measures shall be taken to prevent or control spills of fuels, lubricants, or other toxic materials used in construction from entering the watercourse.

G. Removal of riparian vegetation in the utility line right-of-way shall be limited to that necessary for equipment access. Effective erosion and sedimentation control measures must be employed at all times during the project to prevent degradation of waters of the Commonwealth. Site regarding and reseeding will be accomplished 14 days after disturbance.

H. To the maximum extent practicable, all in-stream work under this certification shall be performed during low flow.

I. Heavy equipment, e.g. bulldozers, backhoes, draglines, etc., if required for this project, should not be used or operated within the stream channel. In those instances where such in-stream work is unavoidable, then it shall be performed in such a manner and duration as to minimize turbidity and disturbance to substrates and bank or riparian vegetation.

J. Any fill shall be of such composition that it will not adversely affect the biological, chemical, or physical properties of the receiving waters and/or cause violations of water quality standards. If riprap is utilized, it is to be of such weight and size that bank stress or slump conditions will not be created because of its placement.

K. Removal of existing riparian vegetation should be restricted to the minimum necessary for project construction.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Definitions:

1. Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, SP, GC, SC, ML, and CL.
2. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups MH, CH, OL, OH, and PT. The Contractor shall notify the Engineer if these soil materials are encountered.
3. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, natural or crushed sand.
4. Drainage Fill: Washed, evenly graded mixture of crushed stone, or uncrushed gravel, with 100 percent passing a 1/2 inch sieve and not more than 5 percent passing a No. 4 sieve.
5. Backfill and Fill Materials: Satisfactory soil materials free of debris, waste, frozen materials, vegetable, and other deleterious matter.

PART 3 - EXECUTION

3.1 CLEARING AND GRUBBING

A. Work shall consist of cutting and removing designated trees, stumps, brush, logs, removal of fences, or other loose and projecting material. Unless otherwise specified, it shall also include the grubbing of stumps, roots, and other natural obstructions which, in the opinion of the Engineer, must be removed to execute properly the construction work and operate properly the facility upon the completion of construction.

B. Trees, bushes, and all-natural vegetation shall only be removed with the approval of the Engineer. No cleared or grubbed materials shall be used in backfills or embankment fills. All stumps, roots, and other objectionable material shall be grubbed up so that no roots larger than 3 inches in diameter remain less than 18 inches below the ground surface. All holes and depressions left by grubbing operations shall be filled with suitable material and compacted to grade, as recommended in Paragraph 3.06.

C. Disposal shall be by burning or other methods satisfactory to the Engineer; however, burning will be permitted only when the Contractor has obtained written permission from the local regulatory agency.

D. The Contractor shall also remove from the site and satisfactorily dispose of all miscellaneous rubbish including, but not limited to, masonry, scrap metal, rock, pavement, etc., that is under the fill or to be removed as shown on the Drawings, specified herein, or directed by the Engineer.

E. Existing improvements, adjacent property, utility, and other facilities, and trees, plants, and brush that are not to be removed shall be protected from injury or damage resulting from the Contractor's operations.

F. Trees and shrubs, designated to remain or that are beyond the clearing and grubbing limit, which are injured or damaged during construction operations shall be treated or replaced at the Contractor's expense by experienced tree surgery personnel.

3.2 EROSION CONTROL

A. Temporary measures shall be applied throughout the construction period to control and to minimize siltation to adjacent properties and waterways. Such measures shall include, but not be limited to, the use of berms, silt barriers, gravel or crushed stone, mulch, slope drains, and other methods.

B. These temporary measures shall be applied to erodible material exposed by any activity associated with the construction of this project.

C. Refer to Section 312500, Erosion and Sedimentation Control for requirements.

3.3 EXCAVATION

A. Excavation of every description and of whatever substances encountered within the grading limits of the project shall be performed to the lines and grades indicated on the Drawings. All excavation shall be performed in the manner and sequence as required for the work.

B. All excavated materials that meet the requirements for fill, subgrades, or backfill shall be stockpiled within the site for use as fill or backfill, or for providing the final site grades. Where practicable, suitable excavated material shall be transported directly to any place in the fill areas within the limits of the work. All excavated materials that are not suitable for fill and any surplus of excavated material that is not required for fill shall be disposed of by the Contractor.

C. The site shall be kept free of surface water at all times. The Contractor shall install drainage ditches, dikes and shall perform all pumping and other work necessary to divert or remove rainfall and all other accumulations of surface water from the excavations. The diversion and removal of surface water shall be performed in a manner that will prevent flooding and/or damage to other locations within the construction area where it may be detrimental. The Contractor shall provide, install and operate sufficient trenches, sumps, pumps, hose piping, well points, deep wells, etc., necessary to depress and maintain the groundwater level at least two (2) feet below the base of the excavation during all stages of construction operations. The groundwater table shall be lowered in advance of excavation and maintained a minimum of two (2) feet below the lowest excavation subgrade made until the excavation is backfilled or the structure has sufficient strength and weight to withstand horizontal and vertical soil and water pressures from natural groundwater.

D. Excavations for concrete structural slabs on grade shall extend 2 feet below the indicated bottom of slabs. The over-excavation shall be backfilled with 18 inches, compacted thickness, of over-lot fill material or suitable material as herein specified. The remaining 6 inches of over-excavation shall be backfilled with porous fill material. The porous fill layer shall extend

beyond the limits of the concrete slab a minimum of two (2) feet on all sides as indicated on the Drawings. The porous fill shall be crushed stone or gravel and shall have the following U.S. Standard Sieve gradation:

Sieve	1-1/2	1	3/4	1/2	3/8
% Passing	Min 100	95±5	58±17	Max 15	Max 5

E. Excavations for the construction shall be carefully made to the depths required. Bottoms for footings and grade beams shall be level, clean, and clear of loose material, the lower sections true to size. Bottoms of footings and grade beams, in all locations, shall be at a minimum depth of 30 inches below adjacent exterior finished grade or 30 inches below adjacent existing grade, whichever is lower, whether so indicated or not. Footings and grade beam bottoms shall be inspected by the Engineer before any concrete is placed thereon.

F. In excavations for structures where, in the opinion of the Engineer, the ground is spongy or otherwise unsuitable for the contemplated foundation, the Contractor shall remove such unsuitable material and replace it with suitable material properly compacted.

G. Sheeting and shoring shall be provided as necessary for the protection of the work and for the safety of the personnel. The clearances and types of the temporary structures, insofar as they affect the character of the finished work, will be subject to the review of the Engineer, but the Contractor shall be responsible for the adequacy of all sheeting, bracing, and coffer damming. All shoring, bracing and sheeting shall be removed as the excavations are backfilled in a manner such as to prevent injurious caving; or, if so directed by the Engineer, shall be left in place. Sheeting left in place shall be cut off 18 inches below the surface.

H. Excavation for structures which have been carried below the depths indicated without specific instructions shall be refilled to the proper grade with suitable material properly compacted, except that in excavation for columns, walls, or footings, the concrete footings shall extend to this lower depth. All work of this nature shall be at the Contractor's expense.

3.4 FILL

A. All existing fill below structures and paved areas must be stripped. The upper 6 inches of the natural subgrade below shall be scarified and recompacted at optimum moisture to at least ninety-five percent (95 percent) of Standard Proctor Density ASTM D 698 (latest revision).

B. All vegetation, such as roots, brush, heavy sods, heavy growth of grass, and all decayed vegetable matter, rubbish, and other unsuitable material within the area upon which fill is to be placed shall be stripped or otherwise removed before the fill is started. In no case will such objectionable material be allowed to remain in or under the fill area. Existing fill from excavated areas on site shall be used as fill for open and/or planted areas. Additional fill stockpiled at the site can be used for structural fill if approved by the Engineer. Any additional material necessary for establishing the indicated grades shall be furnished by the Contractor and approved by the Engineer. All fill material shall be free from trash, roots, and other organic material. The best material to be used in fills shall be reserved for backfilling pipelines and for finishing and dressing the surface. Material larger than 3 inches maximum dimension shall not be permitted in the upper 6 inches of the fill area. Fill material shall be placed in successive layers and thoroughly tamped or rolled in a manner approved by the Engineer, each layer being moistened or dried such that the specified degree of compaction shall be obtained. No fill shall

be placed or compacted in a frozen condition or on top of frozen material. No fill material shall be placed when free water is standing on the surface of the area where the fill is to be placed and no compaction of fill will be permitted with free water on any point of the surface of the fill to be compacted.

C. Where concrete slabs are placed on earth, all loam and organic or other unsuitable material shall be removed. Where fill is required to raise the subgrade for concrete slabs to the elevations as indicated on the Drawings or as required by the Engineer, such fill shall consist of suitable material and shall be placed in layers. Each layer shall be moistened or dried such that the specified degree of compaction shall be obtained. All compaction shall be accomplished in a manner and with equipment as approved by the Engineer. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for adjacent fill.

3.5 BACKFILLING

A. After completion of footings, grade beams, and other construction below the elevation of the final grades and prior to backfilling, all forms shall be removed and the excavation shall be cleaned of all trash and debris. Material for backfilling shall be as specified for suitable material, placed and compacted as specified hereinafter. Backfill shall be placed in horizontal layers of the thickness specified and shall have a moisture content such that the required degree of compaction is obtained. Each layer shall be compacted by mechanical tampers or by other suitable equipment approved by the Engineer to the specified density. Special care shall be taken to prevent wedging action or eccentric loading upon or against the structure. Trucks and machinery used for grading shall not be allowed within 45 degrees above the bottom of the footings or grade beams.

B. The trenches shall be backfilled following visual inspection by the Engineer and prior to pressure testing. The trenches shall be carefully backfilled with the excavated materials approved for backfilling, or other suitable materials, free from large clods of earth or stones. Each layer shall be compacted to a density at least equal to that of the surrounding earth and in such a manner as to permit the rolling and compaction of the filled trench with the adjoining earth to provide the required bearing value, so that paving, if required, can proceed immediately after backfilling is completed.

3.6 COMPACTION

A. Suitable material as hereinbefore specified shall be placed in maximum 8 inches horizontal layers. Compaction shall be performed by rolling with approved tamping rollers, pneumatic-tired rollers, three-wheel power rollers, or other approved equipment. The degree of compaction required is expressed as a percentage of the maximum dry density obtained by the test procedure presented in ASTM D-698. Laboratory moisture density tests shall be performed on all fill material. Material shall be moistened or aerated as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction. Compaction requirements shall be as specified below:

Maximum Permissible

Fill Utilized For	Required Density (%)	Lift Thickness As Compacted, Inches
Backfill & Utility Trenches Under Foundations & Pavements	95-100	8
Backfill Around Structures	95-100	8
Field and Utility Trench Backfill Under Sidewalks and Open Areas	90-100	8

B. Field density tests shall be performed in sufficient numbers to ensure that the specified density is being obtained. Tests shall be in accordance with ASTM Standards D 1556 or D 2922/D 3017 and shall be performed as authorized by the Engineer. Payment for field density tests shall be by the Contractor. Contractor shall provide suitable notification for coordination of testing. Delays due to the lack of adequate advance notification shall be the responsibility of the Contractor.

3.7 SITE GRADING

A. Where indicated or directed, topsoil shall be removed without contamination with subsoil and spread on areas already graded and prepared for topsoil, or transported and stockpiled convenient to areas for later application, or at locations specified. Topsoil shall be stripped to full depth and, when stored, shall be kept separate from other excavated materials and piled free of roots, stones, and other undesirable materials.

B. Following stripping, fill areas shall be scarified to a minimum depth of 6 inches to provide bond between existing ground and the fill material. Material should be placed in successive horizontal layers not exceeding 12 inches of uncompacted thickness. In general, layers shall be placed approximately parallel to the finished grade line.

C. In general and unless otherwise specified, the Contractor may use any type of earthmoving equipment he has at his disposal, provided such equipment is in satisfactory condition and of such type and capacity that the work may be accomplished properly and the grading schedule maintained. During construction, the Contractor shall route equipment at all times, both when loaded and empty, over the layers as they are placed, and shall distribute the travel evenly over the entire area.

D. The material in the layers shall be of the proper moisture content before rolling or tamping to obtain the prescribed compaction. Wetting or drying throughout the layer shall be required. Should the material be too wet to permit proper compaction or rolling, all work on the fill thus affected shall be delayed until the material has dried to the required moisture content. If the material is too dry, it shall be sprinkled with water and manipulated to obtain the uniform moisture content required throughout a layer before it is compacted.

E. Each layer of the fill shall be compacted by rolling or tamping to the standard specified in Paragraph 3.06 and not less than 90 percent maximum density at optimum moisture content as determined by field density tests made by the Standard Proctor method. In general and unless otherwise specified, the Contractor may use any type of compaction equipment such as sheep-foot rollers, pneumatic rollers, smooth rollers, and other such equipment he has at his disposal, provided such equipment is in satisfactory condition and is of such design, type, size, weight,

and quantity to obtain the required density in the embankment. If at any time the required density is not being obtained with the equipment then in use by the Contractor, the Engineer may require that different and/or additional compaction equipment be obtained and placed in use at once to obtain the required compaction.

F. The Contractor shall be responsible for the stability of all embankments and shall replace any portion which, in the opinion of the Engineer, has become displaced due to carelessness or negligence on the part of the Contractor.

3.8 TOPSOIL

A. Provide all labor, materials, equipment, and services required for furnishing and placing topsoil. Samples of topsoil shall be submitted to the Engineer for review before topsoil is placed. The material shall be good quality loam and shall be fertile, friable, mellow; free from stones larger than 1 inch, excessive gravel, junk metal, glass, wood, plastic articles, roots and shall have a liberal amount of organic matter. Light sand loam or heavy clay loam will not be acceptable.

B. The topsoil shall be 3 inches thick in all areas to be seeded. No topsoil shall be placed until the area to be covered is excavated or filled to the required grade. Imported backfill material will be stockpiled on site for structure backfilling and top soiling.

END OF SECTION 312000

SECTION 312319 – DEWATERING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor and equipment required to dewater all excavations.

B. Dewatering of all excavations shall be the responsibility of the Contractor, and no additional compensation will be allowed for same unless specifically included as a bid item.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork is included in Section 312000.

B. Erosion and Sedimentation Control is included in Section 312500.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL

A. Dewatering equipment shall be of adequate size and quantity to ensure maintaining proper conditions for installing pipe, concrete, backfill, or other material or structure in the excavation.

B. Dewatering shall include proper removal of any and all liquid, regardless of its source, from the excavation and the use of all practical means available to prevent surface runoff from entering any excavation.

C. The site shall be kept free of surface water at all times. The Contractor shall install drainage ditches, dikes and shall perform all pumping and other work necessary to divert or remove rainfall and all other accumulations of surface water from the excavations. The diversion and removal of surface water shall be performed in a manner that will prevent flooding and/or damage to other locations within the construction area where it may be detrimental. The Contractor shall provide, install and operate sufficient trenches, sumps, pumps, hose piping, well points, deep wells, etc., necessary to depress and maintain the groundwater level at least 2 feet below the base of the excavation during all stages of construction operations. The groundwater table shall be lowered in advance of excavation and maintained a minimum of 2 feet below the lowest excavation subgrade made until the structure has sufficient strength and weight to withstand horizontal and vertical soil and water pressures from natural groundwater.

D. Dewatering operations should not discharge into the sanitary sewer system, or into any ditch, pipe, or other conveyance that leads to a regulated water body, except as authorized by permit.

END OF SECTION 312319

SECTION 312500 – EROSION AND SEDIMENTATION CONTROL (Areas Less Than One Acre)

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials, and equipment required for erecting, maintaining and removing temporary erosion and sedimentation controls as shown on the Drawings and as specified herein and as recommended by state and local regulatory agencies.

B. Temporary erosion controls include, but are not limited to grassing, mulching, seeding, providing erosion control and turf reinforcement mats on all disturbed surfaces including waste area surfaces and stockpile and borrow area surfaces; scheduling work to minimize erosion and providing interceptor ditches at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits.

C. Temporary sedimentation controls include, but are not limited to, silt dams, traps, barriers, and appurtenances on sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits.

D. Contractor is responsible for providing and maintaining effective temporary erosion and sediment control measures prior to and during construction or until final controls become effective.

E. The Contractor shall be responsible for placement of erosion and sedimentation controls. Prior to construction, the Contractor shall develop an erosion control plan and submit to the Engineer for review. Prior to excavation, fill or grade work, the Contractor shall place controls in locations required by the erosion control plan. If during the course of construction, the Engineer determines additional controls are required, the Contractor shall furnish, install and maintain additional mulching, blankets and/or sediment barriers to control erosion and sedimentation to the satisfaction of the Engineer.

F. The Contractor shall notify the appropriate state agency before beginning construction and shall implement erosion control measures as may be required by state and federal agencies. If disturbed area is greater than one acre, Contractor shall submit a signed Notice of Intent form to the Division of Water at least 48 hours prior to beginning of construction activity.

G. The Contractor shall inspect and repair all erosion and sedimentation controls every seven (7) days and after each rainfall of 0.5 inch or greater.

H. Bare soil areas must be seeded, mulched, or covered after 14 days if no work will be done in the area within the next 7 days.

1.2 RELATED WORK

A. Dewatering is included in this Division, Section 312319.

B. Final erosion protection measures where required are included in this Section.

C. Utility Line Stream Crossings – Division 2

PART 2 – PRODUCTS

2.1 SEED

A. The seed mixture to be sown shall be in the following proportions:

Common Name	Proportion By Weight	% of Purity	% of Germination
Fine Lawn Fescue	40	90	85
Chewings Fescue	25	90	85
Italian Rye Grass	20	90	85
Red Top	10	90	85
White Clover	5	95	90

B. All seed shall be fresh and clean and shall be delivered mixed, in unopened packages, bearing a guaranteed analysis of the seed mixture.

2.2 FERTILIZER

A. Just prior to the planting of turf, evenly broadcast 15 pounds per thousand square feet of fertilizer, 10-10-10 (nitrogen, phosphorus, potassium). Disc or harrow fertilizer 2 to 4 inches into the soil.

B. Fertilizer shall be delivered to the site in the original unopened container bearing the manufacturer's guarantee analysis. Any fertilizer that becomes caked or damaged making it unsuitable for use, will not be accepted.

2.3 SOD

A. Sod shall be at least 70% Bluegrass, strongly rooted and free of weeds.

B. It shall be mowed to a height not to exceed 3" before lifting and shall be of uniform thickness with not over 1-1/2" of soil.

2.4 MULCH

A. Mulch for seeded areas shall be Conwed Hydro Mulch, Silva-Fiber, or equal. It shall be suitable for use in a water slurry or for application with hydraulic equipment.

B. Clean straw is acceptable as mulch. It shall be spread at the rate of one (1) bale per 1,000 feet (approximately 2-inch loose depth).

C. Mulch on slopes at or greater than 3:1 shall be held in place with turf reinforcement mat.

D. Mulch on areas subject to surface water run-off or in drainage ditches shall be held in place with turf reinforcement mat.

2.5 EROSION CONTROL BLANKETS

A. Erosion Control Blanket shall be made up of biodegradable and/or photodegradable products such as jute, wood fiber, coconut fiber, straw, and degradable plastic netting. They shall degrade at a rate of approximately 6 months to 24 months.

B. Erosion Control Blanket shall be installed on slopes less than 3:1.

2.6 TURF REINFORCEMENT MAT

A. Where indicated on the Contract Drawings or as described in the Specifications, in all ditches and drainage channels and on all slopes equal to or greater than 3:1, Turf Reinforcement Mat shall be installed for long-term erosion control.

B. Turf Reinforcement Mat shall consist of top- and bottom-heavy weight netting and biodegradable matrix such as coconut fiber or aspen curled wood excelsior, as manufactured by Western Excelsior Excel PP5-8 Turf Reinforcement Mat or equal. Product shall degrade at a minimum rate of 36 months.

C. Where slope and hydraulic conditions are severe, a synthetic matrix may be used, based on manufacturer's recommendations.

2.7 SILT FENCE

A. Temporary Silt Fence shall consist of woven geotextile fabric attached to 2" X 2" X 48" tall hardwood stakes.

1. Exposed Fabric shall be 36 inches and a minimum of 4 inches shall be buried in trench as shown on the Detail Drawings.
2. Stakes shall be at 6' centers unless stated otherwise on Contract Documents.

B. Temporary Reinforced Silt Fence

1. For areas of steep slopes and high flows, where indicated on the Contract Drawings, or as directed by state or local regulations, a Reinforced Silt Fence shall be installed.
2. Fabric shall be woven monofilament geotextile attached to 11-gauge steel fencing of 2 inch X 4 inch grid.
3. Stakes shall be 5 feet tall steel and shall be installed on 4 foot centers.
4. Fabric and fencing shall be buried in trench as shown on the Detail Drawings.

C. Spacing of Silt Fences on slopes shall be according to the following table, or as directed by state or local regulatory agencies:

Slope Angle	Soil Type		
	Silty	Clays	Sandy
Very Steep (1:1)	50 ft.	75 ft.	100 ft.
Steep (2:1)	75 ft.	100 ft.	125 ft.
Moderate (4:1)	100 ft.	125 ft.	150 ft.
Slight (10:1)	125 ft.	150 ft.	200 ft.

D. If runoff flows along the uphill side of the silt fence, Contractor shall install "J-hooks" every 40 to 80 feet. These are curved sections of silt fence above the continuous fence that serve as small dams to stop and hold the flow to allow sediment to settle.

2.8 FIBER ROLLS

A. On long slopes less than 10:1, and where indicated on the Contract Drawings or recommended by the regulatory agency, Fiber Rolls shall be installed.

B. Fiber Rolls shall be made of wood shavings, coconut fiber or other similar material encased in heavy-duty netting.

C. Wooden stakes at 4'-0" on center shall be used to anchor the Fiber Rolls along the contours of the slope.

2.9 AGGREGATE SILT CHECKS

A. Where needed to slow flow velocity, to cause ponding or to protect stormwater inlet structures, Aggregate Silt Checks shall be installed.

B. Aggregate Silt Checks shall consist of rock of various sizes ranging from 2 inches to 6 inches contained in or placed on geotextile filter fabric. Pea-stone or gravel-filled bags are acceptable for temporary silt checks in low-flow conditions.

2.10 RIP RAP

A. Rip Rap shall be installed at the outlets of storm drains and on channel banks as noted on the Contract Drawings and/or recommended by state and local regulatory agencies.

B. Rip Rap shall have no less than 80 percent, by volume, of individual stones that range in size from 0.0247 to 1.483 cubic feet.

2.11 CONSTRUCTION ENTRANCE PAD

A. Contractor shall construct entrance pads at all locations where vehicles will enter or exit the site.

B. Pad shall be a minimum of 20 feet wide, 50 feet long and 6 inches thick, and consist of No. 2 stone laid on top of filter fabric.

PART 3 - EXECUTION

3.1 GENERAL

A. Erosion and sediment control practices shall be consistent with the requirements of the state and local regulatory agencies and in any case shall be adequate to prevent erosion of disturbed and/or regraded areas.

B. Contractor is responsible for notifying the state regulatory agency concerning inclusion under the NPDES General Permit for Storm Water Discharges From Construction Activities.

C. Gravity sewer lines and force mains that cross steams shall be constructed by methods that maintain normal stream flow and allow for a dry exaction. Water pumped from the excavation shall be contained and allowed to settle prior to reentering the stream. Excavation equipment and vehicles shall operate outside of the flowing portion of the stream. Spoil material from the sewer line excavation shall not be allowed to enter the flowing portion of the stream. The provisions of this condition shall apply to all types of utility line stream crossings.

D. Removal of riparian vegetation in the utility line right-of-way shall be limited to that necessary for equipment access. Effective erosion and sedimentation control measures must be employed at all times during the project to prevent degradation of waters of the Commonwealth. Site regrading and reseeding will be accomplished with 14 days after disturbance.

3.2 SEEDING

A. The areas to be seeded shall be thoroughly tilled to a depth of at least 4" by discing, harrowing, or other approved methods until the condition of the soil is acceptable to the Engineer. After harrowing or discing, the seed bed shall be dragged and/or hand raked to finish grade.

B. The incorporation of the fertilizer and the agricultural lime may be a part of the tillage operation and shall be applied no less than 24 hours nor more than 48 hours before the seed is to be sown.

C. Seed shall be broadcast either by hand or approved sowing equipment at the rate of ninety (90) pounds per acre (two pounds per 1,000 square feet), uniformly distributed over the area. Broadcasting seeding during high winds will not be permitted. The seed shall be drilled or raked into a depth of approximately 2 inch and the seeded areas shall be lightly raked to cover the seed and rolled. Drilling seeding shall be done with approved equipment with drills not more than 3 inches apart. All ridges shall be smoothed out, and all furrows and wheel tracks likely to develop into washes, shall be removed.

D. After the seed has been sown, the areas so seeded shall be mulched with clean straw at the rate of one (1) bale per 1,000 feet (approximately 2-inch loose depth). Mulch on slopes and in all ditches and drainage channels shall be held in place with erosion control blankets.

E. Areas seeded shall be watered and protected until a uniform stand develops, and then inspected periodically and maintained appropriately. Displaced mulch shall be replaced or any damage to the seeded area shall be repaired promptly, both in a manner to cause minimum disturbance to the existing stand of grass. If necessary to obtain a uniform stand, the Contractor shall refertilize, reseed and remulch as needed. Scattered bare spots up to one (1) square yard in size will be allowed up to a maximum of 10 percent of any area.

F. Payment for seeding and mulching shall be included in the Contractor's bid.

3.3 SOD

A. To install, bring soil to final grade and clear of trash, wood, rock, and other debris. Apply topsoil, fertilizer at approximately 1000 lbs per acre.

B. Use sod within 36 hours of cutting. Lay sod in straight lines. Butt joints tightly, but do not overlap joints or stretch sod. Stagger joints in adjacent rows in a brickwork type pattern. Use torn or uneven pieces on the end of the row.

C. Notch into existing grass. Anchor sod with pins or stakes if placed on slopes greater than 3:1. Roll or tamp sod after installation and water immediately. Soak to a depth of 4 to 6 inches. Replace sod that grows poorly. Do not cut or lay sod in extremely wet or cold weather. Do not mow regularly until sod is well established.

3.4 INSTALLATION OF EROSION AND SEDIMENT CONTROL DEVICES

A. All erosion and sediment control products and materials shall be installed per manufacturer's recommendations and in accordance with the Kentucky Erosion Prevention and Sediment Control Field Guide.

B. Contractor shall pay special attention to the trenching-in of the bottoms of silt fence, the staking of sediment barriers, and the stapling of erosion control blankets.

3.5 MAINTENANCE OF EROSION AND SEDIMENT CONTROL DEVICES

A. Erosion and sedimentation controls shall be inspected weekly and after rain events of 0.5 inch or greater. Replace silt fencing as needed, filter stone which is dislodged, erosion control blanket which is damaged, and make other necessary repairs.

B. Remove sediment from fences and barriers when it accumulates to half the height of the barrier, or more often as needed.

3.6 CLEAN UP

A. Upon completion of the project and/or establishment of satisfactory turf, vegetation or permanent erosion control structures, Contractor shall remove all temporary devices and properly dispose of such.

END OF SECTION 312500

SECTION 315000 – EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. This Section includes, but is not limited to, the following:

1. Shoring and bracing are necessary to protect existing buildings, streets, walkways, utilities, and other improvements and excavation against loss of ground or caving embankments.
2. Maintenance of shoring and bracing.
3. Removal of shoring and bracing, as required.

B. Types of shoring and bracing systems include, but are not limited to, the following:

1. Steel H-section (soldier) piles.
2. Timber lagging.
3. Steel sheet piles.
4. Portable Steel Trench Box.

C. Building excavation is specified in another Section.

1.2 RELATED DOCUMENTS

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

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Section 013323.

Layout drawings for excavation support system and other data prepared by, or under the supervision of, a qualified professional engineer. System design and calculations must be acceptable to local authorities having jurisdiction. This submittal is for information only. Engineer's review is not for adequacy design, but to verify that it has been designed by a licensed professional. Design of shoring is part of means and methods of construction and remains solely the responsibility of the contractor.

1.4 QUALITY ASSURANCE

A. Engineer Qualifications: A professional engineer legally authorized to practice in jurisdiction where Project is located, and experienced in providing successful engineering services for excavation support systems similar in extent required for this Project.

B. Supervision: Engage and assign supervision of excavation support system to a qualified professional engineer foundation consultant.

C. Regulations: Comply with codes and ordinances of governing authorities having jurisdiction.

1.5 JOB CONDITIONS

A. Before starting work, verify governing dimensions and elevations. Verify condition of adjoining properties. Take photographs to record any existing settlement or cracking of structures, pavements, and other improvements. Prepare a list of such damages, verified by dated photographs, and signed by Contractor and others conducting investigation.

B. Survey adjacent structures and improvements, employing qualified professional engineer, establishing exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

C. During excavation, resurvey benchmarks weekly, maintaining accurate log of surveyed elevations for comparison with original elevations. Promptly notify Engineer if changes in elevations occur or if cracks, sags, or other damage is evident.

1.6 EXISTING UTILITIES

A. Protect existing active sewer, water, gas, electricity, and other utility services and structures.

B. Notify municipal agencies and service utility companies having jurisdiction. Comply with requirements of governing authorities and agencies for protection, relocation, removal, and discontinuing of services.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide adequate shoring and bracing materials which will support loads imposed. Materials need not be new but should be in serviceable condition.

B. Structural Steel: ASTM A 36.

C. Steel Sheet Piles: ASTM A 328.

D. Timber Lagging: Any species, rough-cut, mixed hardwood, nominal 3 inches thick, unless otherwise indicated.

E. Portable Steel Trench Box shall be OSHA-approved.

PART 3 - EXECUTION

3.1 SHORING

A. Wherever shoring is required, locate the system to clear permanent construction and to permit forming and finishing of concrete surfaces. Provide shoring system adequately anchored and braced to resist earth and hydrostatic pressures.

B. Shoring systems retaining earth on which the support or stability of existing structures is dependent must be left in place at completion of work.

3.2 BRACING

A. Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move a brace, install new bracing prior to removal of original brace.

B. Do not place bracing where it will be cast into or included in permanent concrete work, except as otherwise acceptable to Engineer.

C. Install internal bracing, if required, to prevent spreading or distortion of braced frames.

D. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

E. Remove sheeting, shoring, and bracing in stages to avoid disturbance to underlying soils and damage to structures, pavements, facilities, and utilities.

F. Repair or replace, as acceptable to Engineer, adjacent work damaged or displaced through installation or removal of shoring and bracing work.

END OF SECTION 315000

DIVISION 33

UTILITIES

SECTION 330523 – STEEL CASING PIPE

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment and services required to furnish and install all bored and jacked carrier pipes in encasement pipes under railroad and highway crossings as shown on the Drawings and/or specified herein.

B. Where contradictions exist between LaGrange Utilities Commission Water and Sanitary Sewer Specifications and Standard Drawings and the specification below, the LaGrange Utilities Commission specifications and drawings shall govern.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork: Section 312000

B. Piping: Division 33

1.3 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.

B. At the time of submission, the Contractor shall, in writing, call the Engineer's attention to any deviations that the submittals may have from the requirements of the Contract Drawings and Specifications.

C. Comply with all requirements of Section 013323.

D. In accordance with the requirements of the General and Special Conditions and this Section, the following table includes, but is not limited to, the items required to be submitted:

Item Description	Shop Drawings	Product Data	Schedules	Installation Data	Parts Lists	Wiring Diagram	Samples	O & M Manual	Certificates	Warranty	Report	Other
Carrier Pipe		X							X			
Casing Pipe		X										
Casing Spacers		X		X								
Casing End Seals		X		X								

1.4 EXISTING CONDITIONS

A. The existing piping & other utilities shown on the Contract Drawings is based on the best available information. The Engineer makes no guarantee as to the accuracy of the locations or type of piping or utility depicted. All new piping that ties into existing lines must be made compatible with that piping.

B. So that piping conflicts may be avoided, Contractor shall locate the utility (vertically & horizontally) well ahead of the pipe laying operation to confirm exact locations of existing piping before installing any new piping.

C. Contractor shall provide all fittings and adapters necessary to complete all connections to existing piping.

PART 2 - PRODUCTS

2.1 CARRIER PIPE

A. Carrier pipe shall be as specified in the applicable Division 33 section unless otherwise noted.

B. The pipe push-on joints shall be restrained by use of a rubber gasket that has stainless steel wedging segments spaced around the gasket. Restrained push-on joint rubber gasket shall be Fast-Grip by American Ductile Iron Pipe, Field Lok 350 Gasket by US Pipe, or Engineer approved equal.

2.2 CASING PIPE

A. Casing pipe shall be steel, plain end, have a minimum yield point strength of 35,000 psi and conform to ASTM A 252 Grade 2 or ASTM A 139 Grade B without hydrostatic tests. The steel pipe shall have welded joints and be in at least 18 foot lengths.

B. The diameter of the casing pipe shall be as follows:

Carrier Pipe Nominal Diameter (Inches)															
4	6	8	10	12	14	15	16	18	20	21	24	27	30	33	36
Casing Pipe Nominal Diameter (Inches)															
10	12	16	18	20	24	24	30	30	30	36	36	42	48	50	50

For carrier pipe sizes greater than 36-inches nominal diameter, the casing pipe diameter size shall be determined by the Engineer or as shown on the Contract Drawings.

C. The wall thickness of the casing pipe shall be as follows:

Casing Pipe Nominal Diameter (Inches)								
Under 20	20 & 22	24	30	36	38	42	48	50
Casing Pipe Nominal Thickness (Inches) - Under Paved Roads Under CSX or other Railroad Right of Way if Coated or Cathodically Protected								
.250 (1/4")	.281 (9/32")	.312 (5/16")	.406 (13/32")	.469 (15/32")	.500 (1/2")	.562 (9/16")	.625 (10/16")	.656 (21/32")
Casing Pipe Nominal Thickness (Inches) - Under CSX or other Railroad Right of Way Uncoated and Cathodically Unprotected								
.312 (5/16")	.344 (11/32")	.375 (3/8")	.469 (15/32")	.532 (17/32")	.562 (9/16")	.625 (5/8")	.688 (11/16")	.719 (23/32")

However, should casing pipe thickness be specified or required on Highway or Railroad permit approval sheets, said permit thickness requirement shall govern. Permit approval sheets will be made available to the Contractor.

2.3 CASING SPACERS

A. Casing spacers shall be installed a maximum of eight (8) feet apart along the length of the carrier pipe and within two (2) feet of each side of a pipe joint, to support the pipe barrel and the weight of its contents. Stainless steel casing spacers shall be bolt-on style with a shell made in two (2) sections of heavy T-304 stainless steel. Connecting flanges shall be ribbed for extra strength. The shell shall be lined with a PVC liner .090" thick with 85-90 durometer. All nuts and bolts are to be 18-8 stainless steel. Runners shall be made of ultra-high molecular weight polymer with inherent high abrasion resistance and a low coefficient of friction. Runners shall be supported by risers made of heavy T-304 stainless steel. The supports shall be mig welded to the shell and all welds shall be fully passivated. Stainless steel casing spacers shall be made by Cascade Waterworks Mfg. Co., or equal.

2.4 CASING END SEALS

A. The annual space between the steel casing pipe and the carrier pipe shall be sealed by use of interlocking link pipe seals. Seals shall be modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall sleeve. Links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with pressure plate under each bolt head and nut. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide an absolutely water-tight seal between the pipe and wall sleeve. Bolts and hardware shall be constructed of 316 stainless steel. Seals shall be "Link-Seal Model S-316 Modular Seal" as manufactured by PSI-Thunderline/Link-Seal, Houston, TX, or approved equal.

B. The Contractor shall determine the required diameter of each casing/carrier pipe installation according to the manufacturer's recommendations before ordering and installing the seal, Carrier pipe shall be accurately centered in the casing pipe and link seals shall be sized, installed and tightened in accordance with the manufacturer's instructions or per method approved by the Engineer.

PART 3 - EXECUTION

3.1 CROSSINGS - GENERAL

A. Where designated on the drawings, crossings beneath state-maintained roads, not to be disturbed shall be accomplished by boring and jacking a casing pipe.

B. Steel casing pipe for crossings shall be bored and/or jacked (or open cut installed where indicated on the Drawings) into place to the elevations shown on the drawings. All joints between lengths shall be solidly butt-welded with a smooth non-obstructing joint inside. The casing pipe shall be installed without bends. The carrier pipe shall be installed after the casing pipe is in place and shall extend a minimum of two (2) feet beyond each end of the casing to facilitate making joint connections. The carrier shall be braced and centered with casing spacers within the casing pipe to preclude possible flotation. Casing spacers shall be installed a maximum of eight (8) feet apart along the length of the carrier pipe within the casing pipe, within two (2) feet of each side of a pipe joint, and the rest evenly spaced. The height of the supports and runners combined shall be sufficient to keep the carrier pipe at least 0.75" from the casing pipe wall at all times. Manufacturer's recommendations may govern these requirements.

C. At each end of the casing pipe, the carrier pipe shall be sealed with casing end seals. The end seals shall extend a minimum of 12 inches in each direction from the end of the casing pipe.

D. Wood skids are not an acceptable method of supporting the carrier pipe.

3.2 CROSSING - RAILROAD

A. All water or sewer line crossings of railroads shall be prominently marked at railroad right-of-way lines, on both sides of the track crossing, by durable, weatherproof signs located over the center of the water line. When possible, signs shall be located so that when standing at one sign, the other marker is visible. Signs shall show the following:

1. Name and address of Owner.
2. Contents of pipe.
3. Pressure in pipe.
4. Pipe depth below grade at point of sign.
5. Emergency telephone number in event of pipe rupture.

B. Contractor must adhere to all safety requirements of the Railway line involved in the crossing.

1. All operations shall be conducted so as to not interfere with, interrupt, or endanger the operation of trains nor damage, destroy, or endanger the integrity of railroad facilities. The Contractor shall provide written acknowledgment to the Railway line that the Contractor and its employees have received, read, and understood the safety rules. Operations will be subject to inspection at any and all time.
2. All cranes, lifts, or other equipment that will be operated in the vicinity of the railroad's electrification and power transmission facilities shall be electrically grounded in an approved manner.
3. At all times, while work is in progress, a field supervisor with no less than twelve (12) months experience in the operation of the equipment being used shall be present. If boring equipment or similar machines are being used, the machine operator shall also have a minimum of twelve (12) months experience in the operation of the equipment being used.
4. Whenever equipment or personnel are working closer than fifteen (15) feet from the centerline of an adjacent track, that track shall be considered as being obstructed. Operations closer than fifteen (15) feet from the centerline of the track shall be conducted only with the permission of, and as directed by, a duly qualified railroad employee present at the site of the work.
5. Crossing the tracks at grade by equipment and personnel is prohibited except by prior arrangement with, and as directed by, the railroad line. A separate permit must be obtained, by the Contractor, for any "at grade" crossing of the tracks.

C. All railroad costs incurred by the Railway line due to work associated with the crossing (inspection, flagging, track work, etc.) shall be paid by the Owner. However, it is the Contractor's responsibility to coordinate the work with the Railway.

D. Contractor shall notify the Railway line's area engineer a minimum of 14 working days prior to desired start of construction.

3.3 BORING AND JACKING

A. The Contractor shall excavate his own pits, as he may deem necessary, and will set his own line and grade stakes which shall be checked by the Engineer. Permits, as required, will be furnished or obtained by the Owner, but shall be in the Contractor's hands before any excavating is commenced.

B. The boring method shall consist of pushing the pipe into the earth with a boring auger rotating within the pipe to remove the spoil.

1. The front of the pipe shall be provided with mechanical arrangements or devices that will positively prevent the auger from leading the pipe so that there will be no unsupported excavation ahead of the pipe.
2. The auger and cutting head arrangement shall be removable from within the pipe in the event an obstruction is encountered. If the obstruction cannot be removed without excavation in advance of the pipe, the pipe shall be abandoned in place and immediately filled with grout.
3. The over-cut by the cutting head shall not exceed the outside diameter of the pipe by more than 2 inches. If voids should develop or if the bored hole diameter is greater than the outside diameter of the pipe by more than approximately 1 inch, grouting or other approved methods must be used to fill such voids.
4. The face of the cutting head shall be arranged to provide a reasonable obstruction to the free flow of soft or poor material.
5. Any method which does not have this boring arrangement will not be permitted. Contractor's boring arrangement plans and methods must be submitted to, and approved by, the Engineer.

C. In the event an obstruction is encountered in boring which cannot be removed, and it becomes necessary to withdraw the casing and commence elsewhere, the hole from which the casing is withdrawn shall be completely backfilled with coarse sand rammed in.

D. Insurance to be furnished by the Contractor to cover this type of work shall be adequate to meet the requirements of the Railroad and/or State or County Highway Departments. Insurance shall consist of comprehensive general liability and automobile liability insurance.

E. Before award of the contract, the Contractor shall furnish a statement of his experience of such work, or if inexperienced, shall advise the Owner as to whom he will sublet the work and give a statement of the experience of the subcontractor, which shall be satisfactory to the Owner.

3.4 CONTRACTOR'S RESPONSIBILITIES

A. Obtain a copy of the Highway Encroachment and/or Railroad Permit before beginning construction.

B. Attend a preconstruction meeting at the construction site with the City Inspector, Railroad Inspector, Highway Inspector Engineer, and Contractor being present.

END OF SECTION 330523

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FACILITY ENCROACHMENT AGREEMENT

THIS AGREEMENT, made and effective as of July 12, 2024, by and between CSX TRANSPORTATION, INC., a Virginia corporation, whose mailing address is 500 Water Street, Jacksonville, Florida 32202, hereinafter called "Licensor," and LAGRANGE UTILITIES COMMISSION, a Kentucky municipality corporation, political subdivision or state agency, whose mailing address is 412 East Jefferson St., LaGrange, Kentucky 40031, hereinafter called "Licensee," WITNESSETH:

WHEREAS, Licensee desires to construct (unless previously constructed and designated as existing herein), use and maintain the below described facility(ies), hereinafter called "Facilities," over, under or across property owned or controlled by Licensor, at the below described location(s):

1. One (1) eight inch (8") diameter sub-grade pipeline crossing, solely for the conveyance of potable water, located at or near La Grange, Oldham County, Kentucky, Louisville Division, Louisville Cincinnati Subdivision, Milepost 00T-25.8, Latitude N38:24:03., Longitude W85:23:52.;

hereinafter, called the "Encroachment," as shown on print(s) labeled Exhibit "A," attached hereto and made a part hereof;

NOW, THEREFORE, in consideration of the mutual covenants, conditions, terms and agreements herein contained, the parties hereto agree and covenant as follows:

1. LICENSE:

1.1 Subject to Article 17, Licensor, insofar as it has the legal right, power and authority to do so, and its present title permits, and subject to:

(A) Licensor's present and future right to occupy, possess and use its property within the area of the Encroachment for any and all purposes, including but not limited to Licensor's track(s) structure(s), power lines, communication, signal or other wires, train control system, cellular or data towers, or electrical or electronic apparatus, or any appurtenances thereto ("Licensor's Facilities") and any other facilities as now exist or which may in the future be located in,upon, over, under or across the property;

(B) All encumbrances, conditions, covenants, easements, and limitations applicable to Licensor's title to or rights in the subject property; and

(C) Compliance by Licensee and its agent or contractor ("Licensee's Contractor") with the terms and conditions herein contained;

does hereby license and permit Licensee to construct, maintain, repair, renew, operate, use, alter or change the Facilities at the Encroachment above for the term herein stated, and to remove same upon termination.

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1.2 The term Facilities, as used herein, shall include only those structures and ancillary facilities devoted exclusively to the transmission usage above within the Encroachment, and as shown on attached Exhibit A.

1.3 No additional structures or other facilities shall be placed, allowed, or maintained by Licensee in, upon or on the Encroachment except upon prior separate written consent of Licensor.

2. ENCROACHMENT FEE; TERM:

2.1 Licensee shall pay Licensor a one-time nonrefundable Encroachment Fee of FIVE THOUSAND ONE HUNDRED AND 00/100 U.S. DOLLARS ($5,100.00) upon execution of this Agreement. Licensee agrees that the Encroachment Fee applies only to the original Licensee under this Agreement. In the event of a successor (by merger, consolidation, reorganization and/or assignment) or if the original Licensee changes its name, then Licensee shall be subject to payment of Licensor's current administrative and document preparation fees for the cost incurred by Licensor in preparing and maintaining this Agreement on a current basis.

2.2 However, Licensee assumes sole responsibility for, and shall pay directly (or reimburse Licensor), any additional annual taxes and/or periodic assessments levied against Licensor or Licensor's property solely on account of said Facilities or Encroachment.

2.3 This Agreement shall terminate as herein provided, but shall also terminate upon: (a) Licensee's cessation of use of the Facilities or Encroachment for the purpose(s) above; (b) removal of the Facilities; (c) subsequent mutual consent; and/or (d) failure of Licensee to complete installation within five (5) years from the effective date of this Agreement.

2.4 In further consideration for the license or right hereby granted, Licensee hereby agrees that Licensor shall not be charged or assessed, directly or indirectly, with any part of the cost of the installation of said Facilities and appurtenances, and/or maintenance thereof, or for any public works project of which said Facilities is a part. Licensee agrees it shall not assess Licensor any stormwater or drainage fee associated with such Facilities. Furthermore, Licensee shall be responsible for any stormwater or drainage fees assessed by any County or State agency managing such systems.

3. CONSTRUCTION, MAINTENANCE AND REPAIRS:

3.1 Licensee shall construct, maintain, relocate, repair, renew, alter, and/or remove the Facilities, in a prudent, workmanlike manner, using quality materials and complying with any applicable standard(s) or regulation(s) of Licensor (CSXT Specifications), or Licensee's particular industry, National Electrical Safety Code, or any governmental or regulatory body having jurisdiction over the Encroachment.

3.2 Location and construction of Facilities shall be made strictly in accordance with design(s) and specifications furnished to and approved by Licensor and of material(s) and size(s) appropriate for the purpose(s) above recited.

3.3 All of Licensee's work, and exercise of rights hereunder, shall be undertaken at time(s) satisfactory to Licensor, and so as to eliminate or minimize any impact on or interference with the safe use and operation of Licensor's property and appurtenances thereto.

3.4 In the installation, maintenance, repair and/or removal of said Facilities, Licensee shall not use explosives on or adjacent to Licensor's property of any type or perform or cause any blasting on or adjacent to Licensor's property without the separate express written consent of Licensor. As a condition to such consent, a representative will be assigned by Licensor to monitor blasting, and Licensee shall reimburse Licensor for the entire cost and/or expense of furnishing said monitor.

3.5 Any repairs or maintenance to the Facilities, whether resulting from acts of Licensee, or natural or weather events, which are necessary to protect or facilitate Licensor's use of its property, shall be made by Licensee promptly, but in no event later than thirty (30) days after Licensee has notice as to the need for such repairs or maintenance.

3.6 Licensor, in order to protect or safeguard its property, rail operations, equipment and/or employees from damage or injury, may request immediate repair or renewal of the Facilities, and if the same is not performed, may make or contract to make such repairs or renewals, at the sole risk, cost and expense of Licensee.

3.7 Neither the failure of Licensor to object to any work done, material used, or method of construction or maintenance of said Encroachment, nor any approval given or supervision exercised by Licensor, shall be construed as an admission of liability or responsibility by Licensor, or as a waiver by Licensor of any of the obligations, liability and/or responsibility of Licensee under this Agreement.

3.8 All work on the Encroachment shall be conducted in accordance with Licensor's safety rules and regulations.

3.9 Licensee hereby agrees to reimburse Licensor any loss, cost or expense (including losses resulting from train delays and/or inability to meet train schedules) arising from any failure of Licensee to make repairs or conduct maintenance as required by Section 3.5 above or from improper or incomplete repairs or maintenance to the Facilities or Encroachment.

3.10 In the event it becomes necessary for the Licensee to deviate from the approved Exhibit, Licensee shall seek prior approval from Licensor, or when applicable, an official field representative of Licensor permitted to approve changes, authorizing the necessary field changes and Licensee shall provide Licensor with complete As-Built Drawings of the completed work. As-Built Drawings shall be submitted to Licensor in either electronic or hard copy form upon the substantial completion of the project and upon Licensor's request.

3.11 In the event of large scale maintenance/construction work to railroad bridges Licensee is required to protect power lines with insulated covers or comparable safety devices at their costs during construction/maintenance for safety of railroad employees.

4. PERMITS, LICENSES:

4.1 Before any work hereunder is performed, or before use of the Encroachment for the contracted purpose, Licensee, at its sole cost and expense, shall obtain all necessary permit(s) (including but not limited to zoning, building, construction, health, safety or environmental matters), letter(s) or certificate(s) of approval. Licensee expressly agrees and warrants that it shall conform and limit its activities to the terms of such permit(s), approval(s) and authorization(s), and shall comply with all applicable ordinances, rules, regulations, requirements and laws of any governmental authority (State, Federal or Local) having jurisdiction over Licensee's activities, including the location, contact, excavation and protection regulations of the Occupational Safety and Health Act (OSHA) (29 CFR 1926.651(b)), et al., and State "One Call" - "Call Before You Dig" requirements.

4.2 Licensee assumes sole responsibility for failure to obtain such permit(s) or approval(s), for any violations thereof, or for costs or expenses of compliance or remedy.

5. MARKING AND SUPPORT:

5.1 With respect to any subsurface installation or maintenance upon Licensor's property, Licensee, at its sole cost and expense, shall:

(A) support track(s) and roadbed in a manner satisfactory to Licensor;

(B) backfill with satisfactory material and thoroughly tamp all trenches to prevent settling of surface of land and roadbed of Licensor; and

(C) either remove any surplus earth or material from Licensor's property or cause said surplus earth or material to be placed and distributed at location(s) and in such manner Licensor may approve.

5.2 After construction or maintenance of the Facilities, Licensee shall:

(A) Restore any track(s), roadbed and other disturbed property; and

(B) Erect, maintain and periodically verify the accuracy of aboveground markers, in a form approved by Licensor, indicating the location, depth and ownership of any underground Facilities or related facilities.

5.3 Licensee shall be solely responsible for any subsidence or failure of lateral or subjacent support in the Encroachment area for a period of three (3) years after completion of installation.

6. TRACK CHANGES:

6.1 In the event that rail operations and/or track maintenance result in changes in grade or alignment of, additions to, or relocation of track(s) or other facilities, or in the event future use of Licensor's rail corridor or property necessitate any change of location, height or depth in the Facilities or Encroachment, Licensee, at its sole cost and expense and within thirty (30) days after notice in writing from Licensor, shall make changes in the Facilities or Encroachment to accommodate such track(s) or operations.

6.2 If Licensee fails to do so, Licensor may make or contract to make such changes at Licensee's cost.

7. FACILITY CHANGES:

7.1 Licensee shall periodically monitor and verify the depth or height of the Facilities or Encroachment in relation to the existing tracks and facilities, and shall relocate the Facilities or change the Encroachment, at Licensee's expense, should such relocation or change be necessary to comply with the minimum clearance requirements of Licensor.

7.2 If Licensee undertakes to revise, renew, relocate or change in any manner whatsoever all or any part of the Facilities (including any change in voltage or gauge of wire or any change in circumference, diameter or radius of pipe or change in materials transmitted in and through said pipe), or is required by any public agency or court order to do so, plans therefor shall be submitted to Licensor for approval before such change. After approval, the terms and conditions of this Agreement shall apply thereto.

8. INTERFERENCE WITH RAIL FACILITIES:

8.1 Although the Facilities/Encroachment herein permitted may not presently interfere with Licensor's Facilities, in the event that the operation, existence or maintenance of said Facilities, in the sole judgment of Licensor, causes: (a) interference (including, but not limited to, physical or interference from an electromagnetic induction, or interference from stray or other currents) with Licensor's power lines, communication, signal or other wires, train control system, or electrical or electronic apparatus; or (b) interference in any manner, with the operation, maintenance or use of Licensor's Facilities; then and in either event, Licensee, upon receipt of written notice from Licensor of any such interference, and at Licensee's sole risk, cost and expense, shall promptly make such changes in its Facilities or installation, as may be required in the reasonable judgment of the Licensor to eliminate all such interference. Upon Licensee's failure to remedy or change, Licensor may do so or contract to do so at Licensee's sole cost.

8.2 Without assuming any duty hereunder to inspect the Facilities, Licensor hereby reserves the right to inspect same and to require Licensee to undertake repairs, maintenance or adjustments to the Facilities, which Licensee hereby agrees to make promptly, at Licensee's sole cost and expense.

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9. RISK, LIABILITY, INDEMNITY:

With respect to the relative risk and liabilities of the parties, it is hereby agreed that:

9.1 To the fullest extent permitted by State law (constitutional or statutory, as amended), Licensee hereby agrees to, defend, indemnify, and hold Licensor harmless from and against any and all liability, loss, claim, suit, damage, charge or expense which Licensor may suffer, sustain, incur or in any way be subjected to, on account of death of or injury to any person whomsoever (including officers, agents, employees or invitees of Licensor), and for damage to or loss of or destruction of any property whatsoever, arising out of, resulting from, or in any way connected with the construction, repair, maintenance, replacement, presence, existence, operations, use or removal of the Facilities or any structure in connection therewith, or restoration of premises of Licensor to good order or condition after removal, EXCEPT when proven to have been caused solely by the willful misconduct or gross negligence of Licensor. HOWEVER, to the fullest extent permitted by State law, during any period of actual construction, repair, maintenance, replacement or removal of the Facilities, wherein agents, equipment or personnel of Licensee are on the railroad rail corridor, Licensee's liability hereunder shall be absolute, irrespective of any joint, sole or contributory fault or negligence of Licensor.

9.2 Licensee's Contractor shall hereby agree to, defend, indemnify, and hold Licensor harmless from and against any and all liability, loss, claim, suit, damage, charge or expense which Licensor may suffer, sustain, incur or in any way be subjected to, on account of death of or injury to any person whomsoever (including officers, agents, employees or invitees of Licensor), and for damage to or loss of or destruction of any property whosoever, arising out of resulting from, or in any way connected with the construction, repair, maintenance, replacement, presence, existence, operations, use or removal of the Facilities or any structure in connection therewith, or restoration of premises of Licensor to good order or condition after removal, EXCEPT when proven to have been caused solely by the willful misconduct or gross negligence of Licensor. HOWEVER, to the fullest extent permitted by State law, during any period of actual construction, repair, maintenance, replacement or removal of the Facilities, wherein agents, equipment or personnel of Licensee are on the railroad rail corridor, Licensee's liability hereunder shall be absolute, irrespective of any joint, sole or contributory fault or negligence of Licensor.

9.3 Use of Licensor's rail corridor involves certain risks of loss or damage as a result of the rail operations. Notwithstanding Section 9.1, Licensee expressly assumes all risk of loss and damage to Licensee's Property or the Facilities in, on, over or under the Encroachment, including loss of or any interference with use or service thereof, regardless of cause, including electrical field creation, fire or derailment resulting from rail operations. For this Section, the term "Licensee's Property" shall include property of third parties situated or placed upon Licensor's rail corridor by Licensee or by such third parties at request of or for benefit of Licensee.

9.4 To the fullest extent permitted by State law, as above, Licensee assumes all responsibility for, and agrees to defend, indemnify and hold Licensor harmless from: (a) all

claims, costs and expenses, including reasonable attorneys' fees, as a consequence of any sudden or nonsudden pollution of air, water, land and/or ground water on or off the Encroachment area, arising from or in connection with the use of this Encroachment or resulting from leaking, bursting, spilling, or any escape of the material transmitted in or through the Facilities; (b) any claim or liability arising under federal or state law dealing with either such sudden or nonsudden pollution of air, water, land and/or ground water arising therefrom or the remedy thereof; (c) any subsidence or failure of lateral or subjacent support of the tracks arising from such Facilities leakage; and (d) all claims, costs and expenses, including reasonable attorneys' fees, as a consequence of any drainage or runoff on or off the Encroachment area as a result of the Facilities/Encroachment herein permitted.

9.5 Notwithstanding Section 9.1, Licensee also expressly assumes all risk of loss which in any way may result from Licensee's failure to maintain either required clearances for any overhead Facilities or the required depth and encasement for any underground Facilities, whether or not such loss(es) result(s) in whole or part from Licensor's contributory negligence or joint fault.

9.6 Obligations of Licensee hereunder to release, indemnify and hold Licensor harmless shall also extend to companies and other legal entities that control, are controlled by, subsidiaries of, or are affiliated with Licensor, as well as any railroad that operates over the rail corridor on which the Encroachment is located, and the officers, employees and agents of each.

9.7 If a claim is made or action is brought against Licensor, and/or its operating lessee, for which Licensee may be responsible hereunder, in whole or in part, Licensee shall be notified to assume the handling or defense of such claim or action; but Licensor may participate in such handling or defense.

9.8 Notwithstanding anything contained in this Agreement, the limitation of liability contained in the state statutes, as amended from time to time, shall not limit Licensor's ability to collect under the insurance policies required to be maintained under this Agreement.

10. INSURANCE:

10.1 Prior to commencement of surveys, installation or occupation of premises pursuant to this Agreement, Licensee shall procure and shall maintain during the continuance of this Agreement, at its sole cost and expense, a policy of

(i) Statutory Worker's Compensation and Employers Liability Insurance with available limits of not less than ONE MILLION AND 00/100 U.S. DOLLARS ($1,000,000.00).

(ii) Commercial General Liability coverage (inclusive of contractual liability) with available limits of not less than FIVE MILLION AND 00/100 U.S. DOLLARS ($5,000,000.00)in combined single limits for bodily injury and property damage and covering the contractual liabilities assumed under this Agreement and naming Licensor, and/or its designee, as additional insured. The evidence of insurance

coverage shall be endorsed to provide for thirty (30) days' notice to Licensor, or its designee, prior to cancellation or modification of any policy. Mail CGL certificate, along with agreement, to CSX Transportation, Inc., Speed Code J180, 500 Water Street, Jacksonville, FL 32202. On each successive year, send certificate to RenewalCOI@csx.com.

(iii) Business automobile liability insurance with available limits of not less than ONE MILLION AND 00/100 U.S. DOLLARS ($1,000,000.00) combined single limit for bodily injury and/or property damage per occurrence naming Licensor, and/or its designee, as additional insured.

(iv) The insurance policies must contain a waiver of subrogation against CSXT and its Affiliates, except where prohibited by law. All insurance companies must be A. M. Best rated A- and Class VII or better.

(v) Such other insurance as Licensor may reasonably require.

(vi) Licensee shall require its contractors to meet minimum insurance requirements above when performing work in relation to this agreement. Licensee will procure and review contractor's insurance certificates to confirm requirements are met. Licensor may request a copy of the insurance certificate.

10.2 If Licensee's Contractor's existing CGL policy(ies) do(es) not automatically cover Licensee's contractual liability during periods of survey, installation, maintenance and continued occupation, a specific endorsement adding such coverage shall be purchased by Licensee's Contractor. If said CGL policy is written on a "claims made" basis instead of a "per occurrence" basis, Licensee shall arrange for adequate time for reporting losses. Failure to do so shall be at Licensee's sole risk.

10.3 Licensor, or its designee, may at any time request evidence of insurance purchased by Licensee to comply with this Agreement. Failure of Licensee to comply with Licensor's request shall be considered a default by Licensee.

10.4 To the extent permitted by law and notwithstanding anything to the contrary in this Agreement, the insurance required and provided by Licensee shall not be subject to the limitations of sovereign immunity.

10.5 (A) In the event Licensee finds it necessary to perform construction or demolition operations within fifty feet (50') of any operated railroad track(s) or affecting any railroad bridge, trestle, tunnel, track(s), roadbed, overpass or underpass, Licensee shall: (a) notify Licensor; and (b) require Licensee's Contractor(s) performing such operations to procure and maintain during the period of construction or demolition operations, at no cost to Licensor, Railroad Protective Liability (RPL) Insurance, naming Licensor, and/or its designee, as Named Insured, written on the current ISO/RIMA Form (ISO Form No. CG 00 35 04 13) with limits of FIVE MILLION AND 00/100 U.S. DOLLARS ($5,000,000.00) per occurrence for bodily injury and property damage, with at least TEN MILLION AND 00/100 U.S. DOLLARS

($10,000,000.00) aggregate limit per annual policy period. The original of such RPL policy shall be sent to and approved by Licensor prior to commencement of such construction or demolition. Licensor reserves the right to demand higher limits.

(B) At Licensor's option, in lieu of purchasing RPL insurance or the 50 foot endorsements from an insurance company (but not CGL insurance), Licensee may pay Licensor, at Licensor's current rate at time of request, the cost of adding this Encroachment, or additional construction and/or demolition activities, to Licensor's Railroad Protective Liability (RPL) Policy for the period of actual construction. This coverage is offered at Licensor's discretion and may not be available under all circumstances.

10.6 Notwithstanding the provisions of Sections 10.1 and 10.2, Licensee, pursuant to State Statute(s), may self-insure or self-assume, in any amount(s), any contracted liability arising under this Agreement, under a funded program of self-insurance, which fund will respond to liability of Licensee imposed by and in accordance with the procedures established by law.

11. GRADE CROSSINGS; PROTECTION SERVICES:

11.1 Nothing herein contained shall be construed to permit Licensee or Licensee's contractor to move any vehicles or equipment over the track(s), except at public road crossing(s), without separate prior written approval of Licensor.

11.2 If Licensor deems it advisable, during any construction, maintenance, repair, renewal, alteration, change or removal of said Facilities, to place watchmen, flagmen, or field construction managers for protection of operations of Licensor or others on Licensor's rail corridor at the Encroachment, and to keep persons, equipment or materials away from the track(s), Licensor shall have the right to do so at the expense of Licensee, but Licensor shall not be liable for failure to do so.

11.3 Subject to consent of Licensor, in its sole discretion, and subject to Licensor's operating rules and labor agreements, Licensee may provide flagmen, in place of Licensor's provision, at Licensee's sole risk, cost and expense, and in such event, Licensor shall not be liable for the failure or neglect of such flagmen. Such flagmen shall be approved by Licensor and shall meet all Licensor's requirement for performing such work.

12. LICENSOR'S COSTS:

12.1 Any additional or alternative costs or expenses incurred by Licensor to accommodate Licensee's continued use of Licensor's property as a result of track changes or changes to Licensor's Facilities shall also be paid by Licensee.

12.2 Licensor's expense for wages ("force account" charges) and materials for any work performed at the expense of Licensee pursuant hereto shall be paid by Licensee within thirty (30) days after receipt of Licensor's bill therefor. Licensor may, at its discretion, request an advance deposit for estimated Licensor costs and expenses.

12.3 Such expense shall include, but not be limited to, cost of railroad labor and supervision under "force account" rules, plus current applicable overhead percentages, the actual cost of materials, and insurance, freight and handling charges on all material used. Equipment rentals shall be in accordance with Licensor's applicable fixed rate. Licensor may, at its discretion, require advance deposits for estimated costs of such expenses and costs.

13. DEFAULT, BREACH, WAIVER:

13.1 The proper and complete performance of each covenant of this Agreement shall be deemed of the essence thereof, and in the event Licensee fails or refuses to fully and completely perform any of said covenants or remedy any breach within thirty (30) days after receiving written notice from Licensor to do so (or within forty-eight (48) hours in the event of notice of a railroad emergency), Licensor shall have the option of immediately revoking this Agreement and the privileges and powers hereby conferred, regardless of encroachment fee(s) having been paid in advance for any annual or other period. Upon such revocation, Licensee shall make removal in accordance with Article 14.

13.2 No waiver by Licensor of its rights as to any breach of covenant or condition herein contained shall be construed as a permanent waiver of such covenant or condition, or any subsequent breach thereof, unless such covenant or condition is permanently waived in writing by Licensor.

13.3 Neither the failure of Licensor to object to any work done, material used, or method of construction or maintenance of said Encroachment, nor any approval given or supervision exercised by Licensor, shall be construed as an admission of liability or responsibility by Licensor, or as a waiver by Licensor of any of the obligations, liability and/or responsibility of Licensee under this Agreement.

14. TERMINATION, REMOVAL:

14.1 All rights which Licensee may have hereunder shall cease upon the date of (a) termination, (b) revocation, or (c) subsequent agreement, or (d) Licensee's removal of the Facility from the Encroachment. However, neither termination nor revocation of this Agreement shall affect any claims and liabilities which have arisen or accrued hereunder, and which at the time of termination or revocation have not been satisfied; neither party, however, waiving any third party defenses or actions.

14.2 Within thirty (30) days after revocation or termination, Licensee, at its sole risk and expense, shall (a) remove the Facilities from the rail corridor of Licensor, unless the parties hereto agree otherwise, (b) restore the rail corridor of Licensor in a manner satisfactory to Licensor, and (c) reimburse Licensor any loss, cost or expense of Licensor resulting from such removal.

15. NOTICE:

15.1 Licensee shall give Licensor at least thirty (30) days written notice before doing any work on Licensor's rail corridor, except that in cases of emergency shorter notice may be given. Licensee shall provide proper notification as follows:

a. For non-emergencies, Licensee shall submit online via the CSX Property Portal from Licensor's web site, via web link: https://propertyportal.csx.com/pub_ps_res/ps_res/jsf/public/index.faces

b. For emergencies, Licensee shall complete all of the steps outlined in Section 15.1 a. above, and shall also include detailed information of the emergency. Licensee shall also call and report details of the emergency to Licensor's Rail Operations Emergency Telephone Number: 1-800-232-0144. In the event Licensor needs to contact Licensee concerning an emergency involving Licensee's Facility(ies), the emergency phone number for Licensee is: 502-222-9325.

15.2 All other notices and communications concerning this Agreement shall be addressed to Licensee at the address above, and to Licensor at the address shown on Page 1, c/o CSXT Contract Management, J180; or at such other address as either party may designate in writing to the other.

15.3 Unless otherwise expressly stated herein, all such notices shall be in writing and sent via Certified or Registered Mail, Return Receipt Requested, or by courier, and shall be considered delivered upon: (a) actual receipt, or (b) date of refusal of such delivery.

16. ASSIGNMENT:

16.1 The rights herein conferred are the privileges of Licensee only, and Licensee shall obtain Licensor's prior written consent to any assignment of Licensee's interest herein; said consent shall not be unreasonably withheld.

16.2 Subject to Sections 2 and 16.1, this Agreement shall be binding upon and inure to the benefit of the parties hereto and their respective successors or assigns.

16.3 Licensee shall give Licensor written notice of any legal succession (by merger, consolidation, reorganization, etc.) or other change of legal existence or status of Licensee, with a copy of all documents attesting to such change or legal succession, within thirty (30) days thereof.

16.4 Licensor expressly reserves the right to assign this Agreement, in whole or in part, to any grantee, lessee, or vendee of Licensor's underlying property interests in the Encroachment, upon written notice thereof to Licensee.

16.5 In the event of any unauthorized sale, transfer, assignment, sublicense or encumbrance of this Agreement, or any of the rights and privileges hereunder, Licensor, at its option, may revoke this Agreement by giving Licensee or any such assignee written notice of such revocation; and Licensee shall reimburse Licensor for any loss, cost or expense Licensor may incur as a result of Licensee's failure to obtain said consent.

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17. TITLE:

17.1 Licensee understands that Licensor occupies, uses and possesses lands, rights-of-way and rail corridors under all forms and qualities of ownership rights or facts, from full fee simple absolute to bare occupation. Accordingly, nothing in this Agreement shall act as or be deemed to act as any warranty, guaranty or representation of the quality of Licensor's title for any particular Encroachment or segment of Rail Corridor occupied, used or enjoyed in any manner by Licensee under any rights created in this Agreement. It is expressly understood that Licensor does not warrant title to any Rail Corridor and Licensee will accept the grants and privileges contained herein, subject to all lawful outstanding existing liens, mortgages and superior rights in and to the Rail Corridor, and all leases, licenses and easements or other interests previously granted to others therein.

17.2 The term "license," as used herein, shall mean with regard to any portion of the Rail Corridor which is owned by Licensor in fee simple absolute, or where the applicable law of the State where the Encroachment is located otherwise permits Licensor to make such grants to Licensee, a "permission to use" the Rail Corridor, with dominion and control over such portion of the Rail Corridor remaining with Licensor, and no interest in or exclusive right to possess being otherwise granted to Licensee. With regard to any other portion of Rail Corridor occupied, used or controlled by Licensor under any other facts or rights, Licensor merely waives its exclusive right to occupy the Rail Corridor and grants no other rights whatsoever under this Agreement, such waiver continuing only so long as Licensor continues its own occupation, use or control. Licensor does not warrant or guarantee that the license granted hereunder provides Licensee with all of the rights necessary to occupy any portion of the Rail Corridor. Licensee further acknowledges that it does not have the right to occupy any portion of the Rail Corridor held by Licensor in less than fee simple absolute without also receiving the consent of the owner(s) of the fee simple absolute estate. Further, Licensee shall not obtain, exercise or claim any interest in the Rail Corridor that would impair Licensor's existing rights therein.

17.3 Licensee agrees it shall not have nor shall it make, and hereby completely and absolutely waives its right to, any claim against Licensor for damages on account of any deficiencies in title to the Rail Corridor in the event of failure or insufficiency of Licensor's title to any portion thereof arising from Licensee's use or occupancy thereof.

17.4 Licensee agrees to fully and completely indemnify and defend all claims or litigation for slander of title, overburden of easement, or similar claims arising out of or based upon the Facilities placement, or the presence of the Facilities in, on or along any Encroachment(s), including claims for punitive or special damages.

17.5 Licensee shall not at any time own or claim any right, title or interest in or to Licensor's property occupied by the Encroachments, nor shall the exercise of this Agreement for any length of time give rise to any right, title or interest in Licensee to said property other than the license herein created.

17.6 Nothing in this Agreement shall be deemed to give, and Licensor hereby expressly waives, any claim of ownership in and to any part of the Facilities.

17.7 Licensee shall not create or permit any mortgage, pledge, security, interest, lien or encumbrances, including without limitation, tax liens and liens or encumbrances with respect to work performed or equipment furnished in connection with the construction, installation, repair, maintenance or operation of the Facilities in or on any portion of the Encroachment (collectively, "Liens or Encumbrances"), to be established or remain against the Encroachment or any portion thereof or any other Licensor property.

17.8 In the event that any property of Licensor becomes subject to such Liens or Encumbrances, Licensee agrees to pay, discharge or remove the same promptly upon Licensee's receipt of notice that such Liens or Encumbrances have been filed or docketed against the Encroachment or any other property of Licensor; however, Licensee reserves the right to challenge, at its sole expense, the validity and/or enforceability of any such Liens or Encumbrances.

18. GENERAL PROVISIONS:

18.1 This Agreement, and the attached specifications, contains the entire understanding between the parties hereto.

18.2 Neither this Agreement, any provision hereof, nor any agreement or provision included herein by reference, shall operate or be construed as being for the benefit of any third person.

18.3 Except as otherwise provided herein, or in any Rider attached hereto, neither the form of this Agreement, nor any language herein, shall be interpreted or construed in favor of or against either party hereto as the sole drafter thereof.

18.4 This Agreement is executed under current interpretation of applicable Federal, State, County, Municipal or other local statute, ordinance or law(s). However, each separate division (paragraph, clause, item, term, condition, covenant or agreement) herein shall have independent and severable status for the determination of legality, so that if any separate division is determined to be void or unenforceable for any reason, such determination shall have no effect upon the validity or enforceability of each other separate division, or any combination thereof.

18.5 This Agreement shall be construed and governed by the laws of the state in which the Facilities and Encroachment are located.

18.6 If any amount due pursuant to the terms of this Agreement is not paid by the due date, it will be subject to Licensor's standard late charge and will also accrue interest at eighteen percent (18%) per annum, unless limited by local law, and then at the highest rate so permitted.

18.7 Licensee agrees to reimburse Licensor for all reasonable costs (including attorney's fees) incurred by Licensor for collecting any amount due under the Agreement.

18.8 The provisions of this License are considered confidential and may not be disclosed to a third party without the consent of the other party(s), except: (a) as required by statute, regulation or court order, (b) to a parent, affiliate or subsidiary company, (c) to an auditing firm or legal counsel that are agreeable to the confidentiality provisions, or (d) to Lessees of Licensor's land and/or track who are affected by the terms and conditions of this Agreement and will maintain the confidentiality of this Agreement.

18.9 Within thirty (30) days of an overpayment in a cumulative total amount of One Hundred Dollars ($100.00) or more by Licensee to Licensor, Licensee shall notify Licensor in writing with documentation evidencing such overpayment. Licensor shall refund the actual amount of Licensee's overpayment within one hundred twenty (120) days of Licensor's verification of such overpayment.

18.10 This Agreement may be executed in any number of counterparts, and such counterparts may be exchanged by electronic transmission. Upon execution by the parties hereto, each counterpart shall be deemed an original and together shall constitute one and the same instrument. A fully executed copy of this Agreement by electronic transmission shall be deemed to have the same legal effect as delivery of an original executed copy of this Agreement for all purposes.

19. CONTRACTOR'S ACCEPTANCE:

19.1 Licensee shall observe and abide by, and shall require Licensee's Contractors to observe and abide by the terms, conditions and provisions set forth in this Agreement. Prior to any commencement of work under this Agreement by Licensee's Contractor, Licensee shall require Licensee's Contractor to execute and deliver to Licensor the Contractor Acceptance form attached hereto as Schedule A to acknowledge Licensee's Contractor's agreement to observe and abide by terms and conditions of the Agreement.

[signature page follows]

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IN WITNESS WHEREOF, the parties hereto have executed this Agreement in duplicate (each of which shall constitute an original) as of the effective date of this Agreement.

Witness for Licensor:

John White

CSX TRANSPORTATION, INC.

By: _____

Print/Type Name: Eric Horton

Print/Type Title: Manager – Real Estate

Witness for Licensee:

Julee Hagan

LAGRANGE UTILITIES COMMISSION

By: _____

Who, by the execution hereof, affirms that he/she has the authority to do so and to bind the Licensee to the terms and conditions of this Agreement.

Print/Type Name: Scot Treece

Print/Type Title: Director

Tax ID No.: 61-6003119

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Schedule "A"

CONTRACTOR'S ACCEPTANCE

This Amendment is and shall be a part of Agreement No. CSX1022328, and is incorporated therein.

To and for the benefit of CSX TRANSPORTATION, Inc. (Licensor") and to induce Licensor to permit Contractor on or about Licensor's property for the purposed of performing work in accordance with the Agreement dated July 12, 2024, between Licensee and Licensor, Contractor hereby agrees to abide by and perform all applicable terms of the Agreement, including, but not limited to Sections 3, 9, 10 of the Agreement.

Witness for Licensor:

_____

CSX TRANSPORTATION INC.

By:_____

Print/Type Name:_____

Print/Type Title:_____

Witness for Licensee's Contractor

_____

_____
LICENSEE'S CONTRACTOR

By: _____
Who, by the execution hereof, affirms that he/she has the authority to do so and to bind the Licensee has the authority to do so and to bind the Licensee to the terms and conditions of this Agreement

NAME: _____

TITLE: _____

DATE: _____

CSX Transportation (CSXT) General Notes (Bore and Jack):

La Grange, Kentucky
Engineering Region (Division): MIDWEST (MW) / Sub Division: LOUISVILLE CINCINNATI (LC) / Nearest DOT: 345580X
Mile Post: 00T 25.8 / Lat_Long: 38.40108,-85.39758

1) CSXT owns its right-of-way for the primary purpose of operating a railroad, and shall maintain unrestricted use of its property for current and future operations.

2) Agency or its contractor shall arrange and conduct its work so that there will be no interference with CSXT operations, including train, signal, telephone and telegraphic services, or damages to CSXT's property, or to poles, wires, and other facilities of tenants of CSXT's property or right-of-way.

3) Refer to the CSXT's "Design & Construction Standard Specifications Pipeline Occupancies" revised June 5, 2018 (4.1.2).

4) Work schedule is subject to the approval of all required construction submittals by the CSXT Construction Representative, verification that proposed work will not conflict with any CSXT U.G. Facilities, and the availability of CSXT Flagging and Protection Services. Construction submittals will be based upon the proposed scope of work and may include, but are not limited to; proposed work plan, project schedule, means and methods, site access, dewatering, temporary excavation/shoring, soil disposition/management, track monitoring, concrete placement work, structural lifting/rigging plans for hoisting operations, substructure construction plans, steel erection plans, roadwork plans, etc. No work may begin on, over, or adjacent to CSXT property, or that could potentially impact CSXT property, operations or safety without the prior completion and approval of the required aforementioned information and approvals.

5) Prior to construction, all signal facilities and/or warning devices at proposed facility crossing, i.e. cantilevers, flashers, and gates must be located and marked/flagged by CSXT. The traditional "One Call" utility locate services are not responsible for locating any CSXT under-grade utilities or facilities Contractor shall be held liable for any damages to CSXT communication & signal facilities.

6) Contractor also has the sole responsibility of ascertaining that all other utilities have been properly located by complying with the local "call before you dig" regulation(s). Contractor shall solely be responsible for notifying owners of adjacent properties and of underground facilities and utility owners when prosecution of the work may affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property.

7) The use of construction safety fencing is required when a CSXT Flagman is not present. Distance of fencing from nearest rail to be determined by the CSXT Track Supervisor and shall be removed upon completion of the project.

8) Contractor access will be limited to the immediate project area only. The CSXT property outside the project area may not be used for contractor access to the project site and no temporary at-grade crossings will be allowed.

9) All material and equipment will be staged to not block any CSXT access or maintenance roads. No hoisting or auxiliary equipment necessary for the procedure shall be placed on CSXT track structure and / or ballast section. Clear working locations for equipment used will be laid out and approved by CSXT's representative prior to equipment set-up. Agency and contractor shall not store their materials or equipment on CSXT's property or where they may potentially interfere with CSXT's operations.

10) CSXT does not grant or convey an easement for this installation.

11) CSXT requires contractors, subcontractors, and vendors to participate in job safety briefings daily and as necessary with the CSXT flagger. The scope of work may require that various protection against train movements be discussed, understood, and utilized. Work shall only be undertaken with the presence and permission of the CSXT flagger. If at any time the CSXT flagger perceives that the hoisting procedure is causing or has the potential to cause a hazard or delay to CSXT operations through the project site, work will cease until such time as satisfactory modifications have been reviewed and approved.

12) The right of way shall be restored to a condition equal to or better than the condition prior to beginning the project before final acceptance will be provided. Punch lists shall be responded to prior to issuance of an acceptance memorandum signed by the CSXT representative.

13) No construction or entry upon the CSXT corridor is permitted until the document transaction is completed, you are in receipt of a fully executed document, and you have obtained authority from CSXT's.

14) The front of the pipe shall be provided with mechanical arrangements or devices that will positively prevent the auger from leading the pipe so that no unsupported excavation is ahead of the pipe. The bore head / auger set-up (sketch or photos) shall be submitted by contractor and accepted by assigned CSXT representative prior to start of the jack & bore.

15) The operation shall be progressed on a 24-hour basis without stoppage (except for adding lengths of pipe) until the leading edge of the pipe has reached the receiving pit.

16) The auger and cutting head arrangement shall be removable from within the pipe in the event an obstruction is encountered.

17) Pipeline shall be prominently marked at both sides of the CSXT property lines by durable, weatherproof signs located over the centerline of the pipe in accordance with CSXT specifications.

18) If required, a dewatering plan in accordance with CSXT specifications will be submitted to the CSXT representative for review and approval prior to any dewatering operations. Dewatering drawdown level at tracks shall be field verified that it meets the approved dewatering design prior to commencement of jack and bore operations.

19) Blasting is not permitted under, on, or adjacent to CSXT property.

20) Jacking pit: identify hazards and put controls in place prior to start of excavation. Contractor shall erect a barrier and construction fence along the face of jacking pit construction limits and not encroach past it when preparing the pit. Stake or mark pit as needed for digging. Erosion control devices shall be placed at the jacking and receiving pits protecting CSXT property and ditches to the satisfaction of the CSXT representative.

21) Excavation: If the excavation is 5 feet or greater in depth, the walls may be sloped at 1.5 horizontal to 1 vertical to reduce the risk of cave-ins or slides. A safe manner in which to enter and exit the excavation must be established. The toe of slopes in excavation shall in no case be undercut by power shovels, bulldozers, graders, blasting, or in any manner. Excavation shall not be made in excess of the authorized cross-section.

22) Backfill, cover or fence all excavations when unattended. The CSXT representative will approve the protection method and the type of fencing material. Set fencing back at least 3 feet (91 centimeters) from the edges of the excavation. Set fence posts securely in the ground and insure the fencing is securely tied to posts with zip ties or some other tie wrap product.

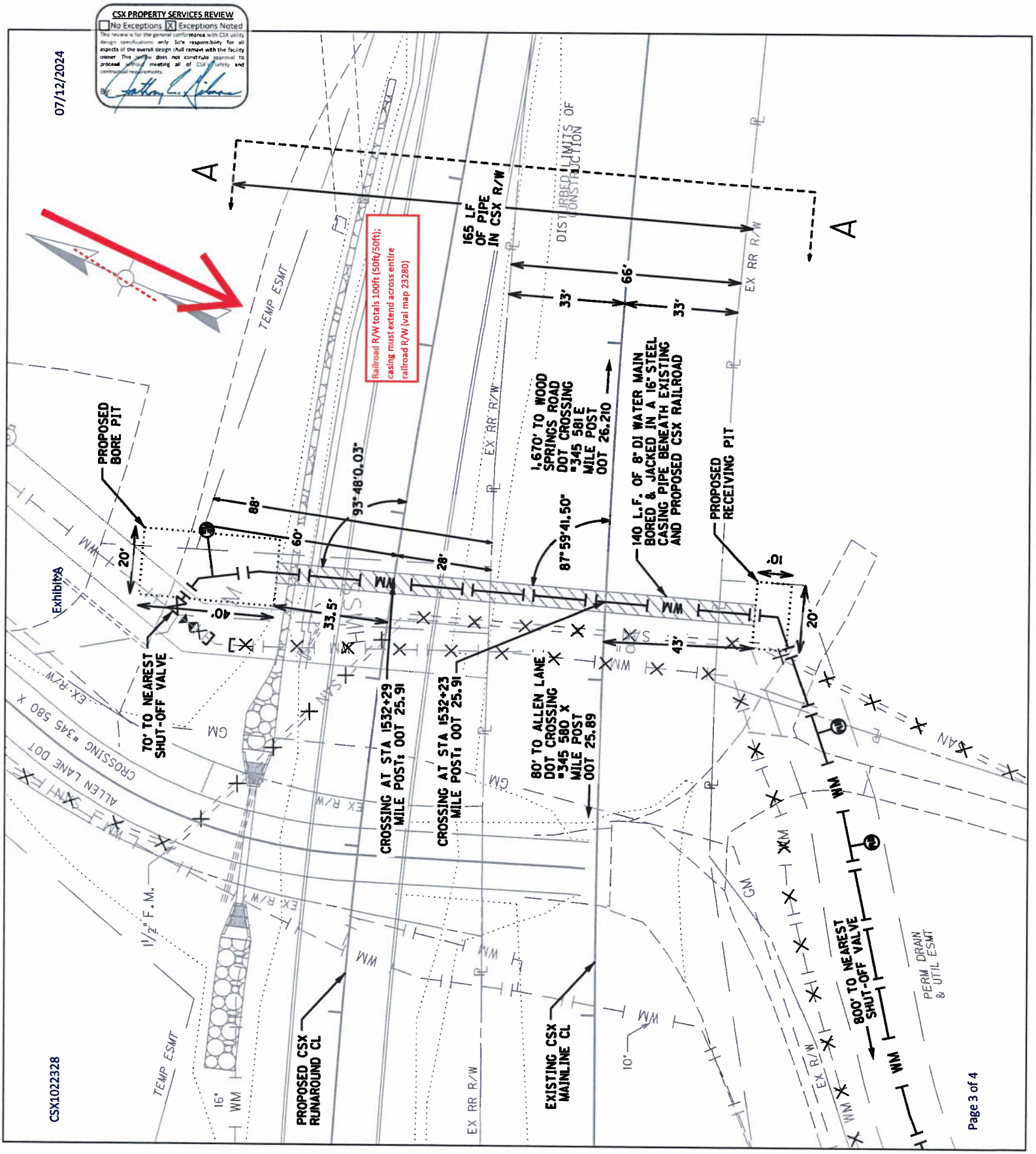
23) For any excavations permitted on CSXT property, all backfill in excavations and trenches shall be compacted to 95% maximum dry density as defined in ASTM standard d1557 and installed in six-inch lifts. In-situ soil shall be used for backfill material. Should additional offsite backfill material be needed, offsite material sources are to meet state and residential clean fill requirements and be preapproved by CSXT's representative. CSXT does not require a specific testing requirement or standard for stone.

24) Track monitoring: prior to commencing jack & bore operations, contractor shall be required to conduct and submit a baseline survey along the top of each rail under CSXT flagger protection and in accordance with the preapproved settlement monitoring construction submittal. Additional survey data shall be collected and submitted once each day during casing pipe installation, or as directed by CSXT representative. Contractor shall also take elevation shots at top of tie and top of casing pipe before starting the bore to verify depth of cover proposed for the work has been met.

25) Projects that generate soils from CSXT property must adhere to CSXT's soil management policies. CSXT requires soils generated from its property to either be reused on CSXT property or properly disposed in a CSXT approved disposal facility. CSXT environmental department will handle waste characterization and profiling into an approved disposal facility. CSXT prohibits any environmental sampling on its property unless granted through a written environmental right-of-entry or approved in writing by the CSXT environmental department. The management of soils generated from CSXT property should be planned for and properly permitted (if applicable) prior to initiating any work on CSXT property. A list of CSXT approved laboratories and/or disposal facilities may be obtained from the CSXT manager environmental pro

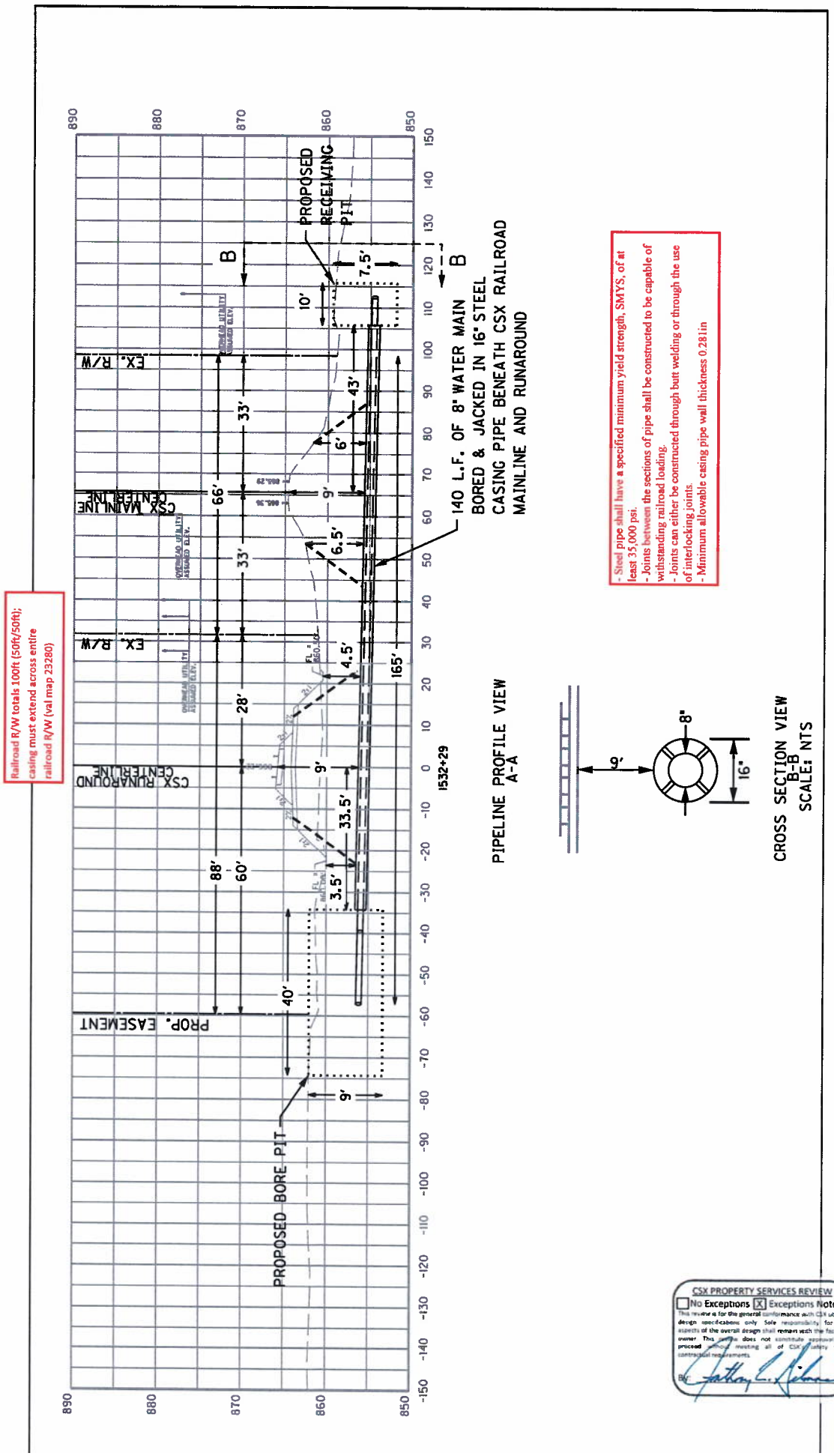
26) CSXT does not represent or warrant the right-of-way dimensions depicted on these drawings. A third party survey is recommended for verification and accuracy.

27) Upon completion of project construction, contractor must submit to CSXT the as-built plans showing the final alignment on CSXT property, including actual depth of facility and any field change to location on CSXT property, pipe materials, number of innerducts, etc.


CSX PROPERTY SERVICES REVIEW
No Exceptions
Exceptions Noted
07/12/2024
CSX1022328
Exhibit A
Page 3 of 4
A
A
165 LF OF PIPE IN CSX R/W
Railroad R/W totals 100ft (50ft/50ft); casing must extend across entire railroad R/W (val map 23280)
DISTURBED LIMITS OF CONSTRUCTION
TEMP ESMT
EX RR R/W
66'
33'
33'
PROPOSED BORE PIT
20'
88'
60'
93°48'0.03"
28'
1,670' TO WOOD SPRINGS ROAD DOT CROSSING "345 581 E MILE POST OOT 26.210
87°59'41.50"
140 L.F. OF 8" DI WATER MAIN BORED & JACKED IN A 16" STEEL CASING PIPE BENEATH EXISTING AND PROPOSED CSX RAILROAD
PROPOSED RECEIVING PIT
10'
20'
40'
33.5'
43'
70' TO NEAREST SHUT-OFF VALVE
CROSSING AT STA 1532+29 MILE POST: OOT 25.91
CROSSING AT STA 1532+23 MILE POST: OOT 25.91
80' TO ALLEN LANE DOT CROSSING "345 580 X MILE POST OOT 25.89
ALLEN LANE DOT CROSSING #345 580 X
EX R/W
1½" F.M.
TEMP ESMT
16" WM
PROPOSED CSX RUNAROUND CL
EXISTING CSX MAINLINE CL
EX RR R/W
10'
800' TO NEAREST SHUT-OFF VALVE
PERM DRAIN & UTIL ESMT
WM
GM
SAN

07/12/2024

Exhibit A



CSX1022328

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SECTION 331113 – WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment, and services required for furnishing and installing all piping and appurtenances specified herein.

B. Where contradictions exist between LaGrange Utilities Commission Water Specifications and Standard Drawings and the specification below, the LaGrange Utilities Commission specifications and drawings shall govern.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Valves - Utility Services: Section 331216

1.3 SUBMITTALS

A. A notarized certification shall be furnished for all pipe and fittings that verifies compliance with all applicable specifications.

B. The requirement for this certification does not eliminate the need for shop drawings submittals in compliance with Section 013323.

C. In accordance with the requirements of the General and Special Conditions and this Section, the following table includes, but is not limited to, the items required to be submitted:

Item Description	Shop Drawings	Product Data	Schedules	Installation Data	Parts Lists	Wiring Diagram	Samples	O & M Manual	Certificates	Warranty	Report	Other
Pipe and Fittings		X							X			
Couplings and Adapters		X										
Detectable UG Tape		X		X								
Tracer Wire		X		X								
Trench Baffles		X		X								
PE Tubing		X										
Corp. Stops and Fittings		X		X								

1.4 EXISTING CONDITIONS

A. The existing piping shown on the Contract Drawings is based on the best available information. The Engineer makes no guarantee as to the accuracy of the locations or type of piping depicted. All new piping which ties into existing lines must be made compatible with that piping.

B. So that piping conflicts may be avoided, Contractor shall open up his trench well ahead of the pipe laying operation to confirm exact locations of existing piping before installing any new piping.

C. Contractor shall provide all fittings and adapters necessary to complete all connections to existing piping.

PART 2 - PRODUCTS

2.1 DUCTILE IRON PIPE AND FITTINGS

A. Ductile iron pipe shall conform to ANSI/AWWA C151/A21.51, latest revision, pressure class 350, with push-on joints unless otherwise noted on Drawings.

B. The interior of the pipe shall be cement-mortar lined with bituminous seal coat in accordance with ANSI/AWWA C104/A21.4, latest revision. Thickness of the lining shall be as set forth in the ANSI/AWWA C104/A21.4 specification unless otherwise directed by the Engineer. The exterior of all pipe, unless otherwise specified, shall receive either coal tar or asphalt base coating a minimum of 1 mil thick.

C. Each piece of pipe shall bear the manufacturer's name or trademark, the year in which it was produced and the letters "DI" or the word "DUCTILE". Pipe manufacturer shall furnish notarized certificate of compliance to the above AWWA or ANSI specifications.

D. Fittings shall be pressure class 350 ductile iron and have mechanical-joints or push-on joints in accordance with ANSI/AWWA C110/A21.10, latest revision and shall conform to the details and dimensions shown therein. Fittings shall have interior cement-mortar lining as specified hereinbefore for the pipe. Compact ductile iron fittings meeting the requirements of ANSI/AWWA C153/A21.53, latest revision, will also be acceptable.

E. Joints for ductile iron pipe and fittings, as described hereinbefore, shall be rubber-gasket joints and be in accordance with ANSI/AWWA C111/A21.11, latest revision. Joints shall have the same pressure rating as the pipe or fitting of which they are a part. Joints shall be installed per the manufacturer's recommendations.

F. Provide ANSI/AWWA C110/A21.10 mechanical joint plugs and locked or restrained pipe joints where indicated on Drawings. Fittings under structures shall be mechanical joint with retainer glands.

2.2 MOLECULARLY ORIENTED POLYVINYL CHLORIDE (PVCO) PRESSURE PIPE

A. PVCO pipe shall be Ultra Blue as manufactured by JM Eagle, Los Angeles, CA or approved equal. PVCO pipe shall conform to AWWA C909 (Iron Pipe Size OD).

B. AWWA C-909 Ultra Blue (Outside Diameter compatible with Iron Pipe Size)

1. 6-inch through 12-inch - PVCO plastic pipe shall conform to ANSI/AWWA C-909, Pressure Class 200, Ultra Blue. PVC pipe shall have a maximum laying length of 20 feet, with bell end and elastomeric gasket, and with plain end for IPS ductile-iron fittings. Elastomeric gasket shall conform with the requirements of ASTM F-477. The seal of the National Sanitation Foundation Testing Laboratory must appear on each pipe.

C. Fittings shall be pressure class 350 ductile iron and have mechanical-joint ends in accordance with ANSI/AWWA C153/A21.53, latest revision. Compact ductile iron fittings shall conform to the details and dimensions shown therein. Fittings shall have interior cement-mortar lining as specified hereinbefore for the pipe. Full bodied fittings per ANSI/AWWA C110/A21.10, latest revision will also be acceptable.

D. The basis of acceptance of PVC plastic water main pipe will be a written, notarized certification, accompanied by a copy of test results, that the pipe and pipe material has been sampled, tested and inspected in accordance with the designated standard specifications. These certifications shall be obtained from the manufacturer and delivered to the Engineer's or Owner's representative on the project site. A sufficient number of tests and certifications shall be made so as to be representative of the complete project. Copies of the test results shall be kept on file by the manufacturer and shall be available for review by the Engineer or Owner upon request.

E. Pipe shall be visually inspected on the project site for proper markings which shall include manufacturer's name or trademark, nominal pipe size, pressure rating for water at 73.4 degrees F., plastic pipe material designation code (e.g. PVC 1120), dimension ratio, AWWA or ASTM designation and pressure class with which the pipe complies, and the National Sanitation Foundation NSF 14 Seal of Approval for drinking water.

2.3 MECHINCAL JOINT PIPE RESTRAINTS

A. Restrained Follower Glands for Ductile Iron Pipe: Restraint for standard mechanical joint fittings on ductile iron pipe shall be incorporated in the design of the follower gland and shall utilize multiple wedge segments that act against the pipe, increasing their resistance as the line pressure increases. The assembled joint shall maintain the maximum flexibility and deflection of all nominal pipe sizes after burial. Restraining gland, wedge segments, and actuating bolts shall be manufactured of high strength ductile iron conforming to the requirements of ASTM A536, Grade 65-45-12. Wedge segments shall be heat treated to a hardness of 370 BHN minimum. Dimensions shall be compatible with standardized mechanical joints conforming to the requirements AWWA C111/ANSI A21.11 and AWWA C153/ANSI 21.53 (latest revision). Breakaway tops shall be incorporated in the design of the actuating bolts to visually ensure proper torque. The actuating bolts must assures precise and consistent operating torque of the breakaway top. The design of the restraining device shall be such that the gland body evenly bears the stress of the restraining load. The mechanical joint restraining devices shall have a minimum working pressure rating of 350psi for sizes 3"-12" and 250psi for 14" and larger and

provide no less than a safety factor of 2:1. Restraint shall be UL Listed and FM approved in applicable sizes.

B. Restrained Follower Glands for Molecularly Oriented PVCO Pipe: Restraint for use on PVCO pipe shall be made specifically for use on PVCO pipe. The standard mechanical joint fittings shall be incorporated in the design of the follower gland and shall utilize multiple wedge segments that act against the pipe, increasing their resistance as the line pressure increases. The assembled joint shall maintain the maximum flexibility and deflection of all nominal pipe sizes after burial. Restraining gland, wedge segments, and actuating bolts shall be manufactured of high strength ductile iron conforming to the requirements of ASTM A536, Grade 65-45-12. Dimensions shall be compatible with standardized mechanical joints conforming to the requirements AWWA C111/ANSI A21.11 and AWWA C153/ANSI 21.53 (latest revision). Breakaway tops shall be incorporated in the design of the actuating bolts to visually ensure proper torque. The actuating bolts must positively assure precise and consistent operating torque of the breakaway top. The mechanical joint restraining devices shall have a working pressure rating of 200psi minimum and provide no less than a safety factor of 2:1. Restraint shall be FM approved in applicable sizes.

C. All Thread Rod: Where indicated on the drawings or as directed by the Engineer, mechanical joint ends that are required to be restrained by use of all thread rods, shall be 3/4-inch in diameter and constructed of 304 stainless steel. Fastening nuts shall also be constructed of 304 stainless steel. Each joint shall be restrained with a minimum of 3 rods per joint.

2.4 COUPLING AND ADAPTORS

A. Flexible couplings shall be of the sleeve type with a middle ring, two wedge shaped resilient gaskets at each end, two follower rings, and a set of steel trackhead bolts. The middle ring shall be flared at each end to receive the wedge portion of the gaskets. The follower rings shall confine the outer ends of the gaskets, and tightening of the bolts shall cause the follower rings to compress the gaskets against the pipe surface, forming a leak-proof seal. Flexible couplings shall be steel with minimum wall thickness of the middle ring or sleeve installed on pipe being 5/16-inch for pipe smaller than 10 inches, 3/8-inch for pipe 10 inches or larger. The minimum length of the middle ring shall be 5-inches for pipe sizes up to 10 inches and 7 inches for pipe 10 inches to 30 inches. The pipe stop shall be removed. Gaskets shall be suitable for 250 psi pressure rating or at rated working pressure of the connecting pipe. Couplings shall be harnessed and be designed for 250 psi.

B. Flanged adapters shall have one end suitable for bolting to a pipe flange and the other end of flexible coupling similar to that described hereinbefore. All pressure piping with couplings or adapters shall be harnessed with full threaded rods spanning across the couplings or adapters. The adapters shall be furnished with bolts of an approved corrosion resistant steel alloy, extending to the adjacent pipe flanges. Flanges on flanged adapter (unless otherwise indicated or required) shall be faced and drilled ANSI B16.1 Class 125.

C. Flexible couplings and flanged adapters shall be as manufactured by Dresser, Rockwell, or equal, per the following, unless otherwise specified and/or noted on the Drawings:

D. Steel couplings for joining same size, plain-end, steel, cast iron, and PVC plastic pipe:

Dresser	Rockwell
Style 138	4ll

E. Transition couplings for joining pipe of different outside diameters:

Dresser	Rockwell
Style 162 (4"-12")	413 steel (2"-24")
Style 62 (2"-24")	415 steel (6"-48")
	433 cast (2"-16")
	435 cast (2"-12")

F. Flanged adapters for joining plain-end pipe to flanged pipe, fittings, valves and equipment:

Dresser	Rockwell
Style 127 cast (3"-12")	912 cast (3"-12")
Style 128 steel (3"-48" C.I. Pipe)	913 steel (3" and larger)
Style 128 steel (2"-96" steel pipe)	

2.5 DETECTABLE UNDERGROUND UTILITY WARNING TAPES

A. Detectable underground utility warning tapes which can be located from the surface by a non-ferrous metal detector shall be installed directly above nonmetallic (PVC, polyethylene, concrete) pipe.

B. The tape shall be a 5.0 mil tape with a 4.5 mil solid aluminum core in a protective polyethylene jacket that is impervious to all know alkalis, acids, chemical reagents and solvents found in the soil.

C. The minimum overall thickness of the tape shall be 5.0 mils and the width shall not be less than 2" wide. Tape width shall be dictated by waterline burial depth. The tape shall be color coded and imprinted with the legend as follows:

Type of Utility	Color Code	Legend
Water	Blue	Caution Buried Water Line Below

D. Detectable underground tape shall be “Underground Tape” as manufactured by Brimar, or approved equal.

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

F. Payment for detectable tapes shall be included in the linear foot price bid of the appropriate bid item(s) unless it is listed as a separate payment item in the bid schedule.

2.5 TRACER WIRE

A. Tracer wire shall be 12 gauge copperhead wire with 30-mil polyethylene jacket. Tracer wire shall be installed with all buried piping, "duct" taped to top of pipe. Tracer wire shall be secured to the top of the pipe by tape a minimum of 3 times on each standard length of pipe.

B. Split Bolt connectors are required when connecting two (2) pieces of tracer wire. Wire and connector shall be wrapped with electrical tape.

C. Tracer wire shall be brought up into locator boxes with grounding devices. Locator boxes shall be valve boxes with a polystyrene donut that fits around the box to serve as a termination point for tracer wire. Locator boxes shall be installed at a maximum of 500 linear feet apart, or where shown on the Drawings.

D. Payment for tracer wire and boxes shall be included in the linear foot price bid of the appropriate bid item(s) unless it is listed as a separate payment item in the bid schedule

2.7 CONCRETE PIPE ANCHORS, THRUST BLOCKS, CRADLE OR ENCASEMENT

A. Where indicated on the Drawings, required by the Specifications or as directed by the Engineer, concrete pipe anchors, thrust blocks, cradles or encasements shall be installed.

B. Concrete shall comply the provisions in KYTC Standard Specifications Section 601 and be Class B. Reinforcing bars shall be installed as indicated on details.

2.8 PRE-FABRICATED TRENCH BAFFLES

A. Where indicated on the Drawings, required by the Specifications, or as directed by the Engineer, Contractor shall install pre-fabricated trench baffles in the pipeline trench.

B. The baffle shall be self-supporting, made of ABS (Acryonitrile Butadiene Styrene) or comparable material, and shall provide a watertight seal around the pipe by use of an elastomeric PVC flexible coupling. The purpose of the baffle is to stop the flow of groundwater along the trench, and around the pipe. The trench baffle shall be "Ripley's Dam" as manufactured by EJP, or equal.

2.9 CONNECTION OF NEW WATER MAINS TO EXISTING SYSTEM

A. The Contractor shall connect the new water main to existing water main where shown on the Drawings or directed by the Engineer, and shall furnish all necessary equipment and materials required to complete the connection.

2.10 CUSTOMER SERVICE RELOCATIONS AND RE-CONNECTIONS

Where water service lines are disturbed, the Contractor shall reconnect the existing service line to the new water main. The Contractor shall furnish and install the necessary piping, couplings, fittings, etc. necessary to complete the service line re-connection.

A. Service Lines Not Crossing a Road

1. Unless indicated otherwise on the plans, all service lines shall be of PE tubing.
2. Existing water meters shall be relocated and a new water meter setter and new meter box shall be installed unless otherwise indicated by the plans.
3. Water service connections shall be made in accordance with the details shown on the Drawings and/or set forth herein. Locations of the various sizes shall be as directed by the Engineer and as shown on the Drawings.

B. Service Lines Crossing County Road, City Streets, or a State Highway

1. Casing pipe shall be directional drilled under paving where required on plans or by the KY Transportation Cabinet. Casing pipe shall be IPS DR-13.5 PE tubing.
2. Service piping shall be pulled through PE casing pipe. Unless indicated otherwise on the plans. All service lines shall be of PE tubing.
3. Existing water meters shall be relocated and a new water meter setter and meter box shall be installed.
4. Water service connections shall be made in accordance with the details shown on the Drawings and/or set forth herein. Locations of the various sizes shall be as directed by the Engineer as shown on the Drawings.

2.11 CORPORATION STOPS AND FITTINGS FOR HOUSE SERVICE RECONNECTIONS

A. Corporation stops, of the size required, shall be tapped directly into the water main for Ductile Iron Pipe or by the use of a tapping saddle for PVC pipe.

B. Corporation stops shall have AWWA C800-66 C.S. threaded inlet. Outlets shall be suitable for the type of service piping furnished and laid, and the Contractor shall verify compatibility with "iron pipe size" or "copper tubing size" service piping as required before ordering stops.

C. Corporation stops shall be Ford Meter Box Type F1000, F1001, F1002 (as required); Mueller H-15005, H-15006, H-15008, H-15009 (as required); Hayes Series 5200, or equal.

D. Fittings shall be brass.

2.12 SERVICE TAPPING SADDLES

A. Service tapping saddles shall consist of bronze outlet castings for OD controlled PVC pipe. Saddles shall consist of two wide bronze casted straps that are permanently hinged together on one side and bolted on the other side. The outlet shall have a thick tapping boss with enough surface on the exterior to apply a pipe wrench when installing the corporation stop. Castings shall be sealed to pipeline with O-ring seals. Saddle outlets shall be threaded per AWWA C800.

B. Service tapping saddles shall by style S-13000 as manufactured by Mueller Co. style S-70 as manufactured by Ford Meter Box Co., or approved equal.

2.13 COMPRESSION COUPLING FITTINGS FOR SERVICE RECONNECTIONS

A. Compression couplings shall comply with AWWA C800-NL. Outlets shall be suitable for the type of service piping furnished and laid, and the Contractor shall verify compatibility with "iron pipe size" or "copper tubing size" service piping as required before ordering stops.

B. Compression couplings shall be Ford Meter Box Type (as required); Mueller 110 Series, (as required); or approved equal.

2.14 METER BOXES

A. Meter box shall be plastic meter box as manufactured by Ford Meter Box Company, Carlson (Old Castle), or approved equal. Meter box shall have smooth interior and annular extension corrugations, and shall be notched at 0 and 180 degrees at the base to accommodate inlet and outlet pipes.

B. Inner diameter of box shall be 18-inches. Minimum depth of box shall be 18-inches.

C. Box shall be high density polyethylene conforming with the minimum requirements of cell classification 424420 B as defined and described in the latest version of ASTM D3350.

2.15 METER BOX COVERS

A. Meter box cover shall be purchased from LaGrange Utilities Commision.

2.16 COPPER SETTERS

A. Meter setter shall be a copper setter as shown on the standard detail drawing with 3/4-inch double purpose ends and be 7-inches high. It shall be all purpose, designed for 5/8-inch x 3/4 inch meters, and be of sufficient height to raise meters above the bottom of the meter box. Setter shall be Ford as manufactured by the Ford Meter Box Company, or approved equal, and shall have an inverted key inlet valve and dual check backflow preventer outlet valve. Setters shall be installed so that the meter is centered in the box.

B. Copper shall conform to STM B-575 copper alloy #122.

C. For new customer service meter setting, the water service line shall be extended a minimum of 5-feet beyond the meter box on the customer end. The end of the extension shall be capped or plugged to prevent entry of foreign material until house connection is made.

2.17 MECHINCAL JOINT GRIPRING PIPE RESTRAINTS

A. Where all spigot end of pipe connects with valves, fittings, or other items that have mechanical-joint ends, connection shall be made with a restrained mechanical-joint gland. Mechanical-joint connection shall be restrained by the wedge action of a restraint ring being compressed onto the circumference of the pipe when the bolts of the mechanical-joint retainer gland are tightened. Restraint rings shall have a built-in stop to prevent excessive stress to the pipe. Restrained

mechanical-joint connections shall be "GRIPRING" by Romac Industries, or Engineer approved equal.

PART 3 - EXECUTION

3.1 EXCAVATION FOR PIPELINE TRENCHES

A. Unless otherwise directed by the Engineer, trenches in which pipes are to be laid shall be excavated in open cut to the depths required by field conditions or as specified by the Engineer. In general this shall be interpreted to mean that machine excavation in earth shall not extend below an elevation permitting the pipe to be properly bedded. Installation shall be in accordance with ANSI/AWWA C600 for ductile iron and Cast Iron O.D. (AWWA) PVC pipe or ASTM F-645 for Iron Pipe O.D. (ASTM) PVC pipe except as modified herein.

B. If the foundation is good firm earth and the machine excavation has been accomplished as set out hereinbefore, the remainder of the material shall be excavated by hand, then the earth pared or molded to give full support to the lower quadrant of the barrel of each pipe. Where bell and spigot is involved, bell holes shall be excavated during this latter operation to prevent the bells from being supported on undisturbed earth. If for any reason the machine excavation in earth is carried below an excavation that will permit the type of bedding specified above, then a layer of granular material shall be placed so that the lower quadrant of the pipe will be securely bedded in compact granular fill.

C. Excavation may be undercut to a depth below the required invert elevation that will permit laying the pipe in a bed of granular material to provide continuous support for the bottom quadrant of the pipe. When this method is used, the bedding shall be as set out in Paragraph 3.02 hereinafter.

D. Trenches shall be of sufficient width to provide free working space on each side of the pipe and to permit proper backfilling around the pipe, but unless specifically authorized by the Engineer, trenches shall in no case be excavated or permitted to become wider then 2'-0" plus the nominal diameter of the pipe at the level of or below the top of the pipe. If the trench does become wider than 2'-0" at the level of or below the top of the pipe, special precaution may be necessary, such as providing compacted, granular fill up to top of the pipe or providing pipe with additional crushing strength as determined by the Engineer after taking into account the actual trench loads that may result and the strength of the pipe being used. The Contractor shall bear the cost of such special precautions as are necessary.

E. All excavated materials shall be placed a minimum of two feet (2') back from the edge of the trench.

F. Before laying the pipe, the trench shall be opened far enough ahead to reveal obstructions that may necessitate changing the line or grade of the pipeline.

G. The trench shall be straight and uniform so as to permit laying pipe to lines and grades given by the Engineer. It shall be kept free of water during the laying of the pipe and until the pipeline has been backfilled. Removal of trench water shall be at the Contractor's expense. Dry conditions shall be maintained in the excavations until the backfill has been placed. During the excavation, the grade shall be maintained so that it will freely drain and prevent surface water

from entering the excavation at all times. When directed by Owner, temporary drainage ditches shall be installed to intercept or direct surface water which may affect work. All water shall be pumped or drained from the excavation and disposed of in a suitable manner without damage to adjacent property or to other work.

H. Minimum cover of 30" shall be provided for all pipelines, except those located in the State Highway Right of Way. Those shall have a minimum cover of 42".

3.2 PIPE BEDDING

A. All pipe shall be supported on a bed of manufactured sand, derived from limestone, with gradation results similar to those shown in the table below. Contractor shall submit gradation test results to the Engineer for approval. Manufactured sand shall be washed and contain no fine particles and or dust. In no case shall pipe be supported directly on rock. Bedding shall be provided in earth bottom trenches, as well as rock bottom trenches. Bedding material shall be free from large rock, foreign material, frozen earth, and shall be acceptable to the Engineer. Bedding shall be a minimum of 6" below pipe barrel. Contractor shall be responsible for all dust control associated with the use of Manufactured Sand.

Sieve	% Retained	Cumulated % Retained	% Passing
3/8" (9.5mm)	0	0	100
#4 (4.76mm)	5	5	95
#18 (2.36mm)	43	48	52
#16 (1.18mm)	23	71	29
#30 (0.6mm)	8	79	21
#50 (0.3mm)	4	83	17
#100 (0.15mm)	3	86	14
#200 (75µm)	3.7	89.8	10.2
Pan (0µm)	1.1	100.0	0

B. In all cases the foundation for pipes shall be prepared so that the entire load of the backfill on top of the pipe will be carried on the barrel of the pipe so that none of the load will be carried on the bells.

C. Where flexible pipe is used, the bedding shall be placed up to at least the spring line (horizontal center line) of the pipe. The bedding material and procedures shall conform to ASTM D 2321 and any Technical Specifications set out hereinafter. If conditions warrant, the Engineer may require the bedding to be placed above the springline of the pipe.

D. Where undercutting and granular bedding is involved it shall be of such depth that the bottom of the bells of the pipe will be at least three inches above the bottom of the trench as excavated. Undercutting is not a separate pay item.

E. In wet, yielding mucky locations where pipe is in danger of sinking below grade or floating out of line or grade, or where backfill materials are of such a fluid nature that such movements of the 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. When ordered by the Engineer, yielding and mucky materials in subgrades shall be removed below ordinary trench

depth in order to prepare a proper bed for the pipe. Crushed stone or other such granular material, if necessary, as determined by the Engineer to replace poor subgrade material, shall be a separate pay item and classified as "Special Granular Fill". Removal of poor material is not a separate pay item.

F. Installation shall be in accordance with ASTM D 2321 except as modified hereinafter.

3.3 SPECIAL GRANULAR FILL

A. Special granular fill shall comply with provisions in KYTC Standard Specifications Section 701.

3.4 LAYING PIPE

A. The laying of pipe in finished trenches shall be commenced at the lowest point so the spigot ends point in the direction of flow.

B. All pipes shall be laid with ends abutting and true to line and grade as given by the Engineer. Supporting of pipes shall be as set out hereinbefore under "Pipe Bedding" and in no case shall the supporting of pipes on blocks be permitted.

C. Before each piece of pipe is lowered into the trench, it shall be thoroughly inspected to ensure that it is clean. Each piece of pipe shall be lowered separately unless special permission is given otherwise by the Engineer. 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. 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.

D. Pipe shall not be laid on solid rock. A pad of granular material as specified in Paragraph 3.02 "Pipe Bedding", shall be used as a pipe bedding. Pipe bedding is not a separate pay item. Irregularities in subgrade in an earth trench shall be corrected by use of granular material.

E. When ordered by the Engineer, unsuitable materials in subgrades shall be removed below ordinary trench depth in order to prepare a proper bed for the pipe.

F. When laying of pipe is stopped for any reason, the exposed end of such pipe shall be closed with a plywood or fabricated plug fitted into the pipe bell, so as to exclude earth or other material, and precautions taken to prevent flotation of pipe by runoff into trench.

G. No backfilling (except for securing pipe in place) over pipe will be allowed until the Engineer has had an opportunity to make an inspection of the joints, alignment and grade, in the section laid.

3.5 BACKFILLING PIPELINE TRENCHES

A. Backfilling of pipeline trenches shall be accomplished as shown on the Drawings and with details set forth hereinafter. Before final acceptance, the Contractor will be required to level off all trenches or to bring the trench up to grade. The Contractor shall also remove from

roadways, rights-of-way and/or private property all excess earth or other materials resulting from construction. In the event that pavement is not placed immediately following trench backfilling in paved areas, the Contractor shall be responsible for maintaining the trench surface in a level condition at proper pavement grade at all times. Under pavement, all trench backfill shall be in accordance with Method C as shown on the Detail Drawings. All other trench backfill shall be in accordance with Method A or B.

B. Method "A" - Backfilling in Open Terrain:

Backfilling of pipeline trenches in open terrain shall be accomplished in the following manner:

1. The lower portion of the trench, from the pipe bedding to a point 12 inches above the top of the pipe, shall be backfilled with manufactured sand, as specific in paragraph 3.2 A, hereinbefore. This material shall be placed in a manner approved by the Engineer, and shall be carefully compacted to avoid displacement of pipe. Compaction shall be accomplished by hand-tapping or by approved mechanical methods.

2. The upper portion of the trench above the compacted portion shall be backfilled with material which is free from large rock. Incorporation of rock having a volume exceeding one-half cubic foot is prohibited. Backfilling this portion of the trench may be accomplished by any means approved by the Engineer. The trench backfill shall be heaped over or leveled as directed by the Engineer.

C. Method "B" - Backfilling Under Sidewalks:

Backfilling of pipeline trenches under sidewalks shall be accomplished in the following manner.

1. The lower portion of the trench, from the pipe bedding to a point 12 inches above the top of the pipe, shall be backfilled with manufactured sand, as specific in paragraph 3.2. A, hereinbefore. This material shall be placed in a manner approved by the Engineer, and shall be carefully compacted to avoid displacement of pipe. Compaction shall be accomplished by hand-tapping or by approved mechanical methods.

2. The middle portion of the trench, from a point 12 inches above the top of the pipe to a point 6 inches below the grade line, shall be backfilled with material free from large rock. Incorporation of rock having a volume exceeding one-half cubic foot is prohibited. Backfilling this portion of the trench may be accomplished by any means approved by the Engineer. Water (puddling) may be used as required to obtain maximum compaction.

   Upon approval of the Engineer, the Contractor may backfill the middle portion of the trench with crushed stone, fine gravel, or sand in lieu of materials which require compaction.

3. The upper portion of the trench shall be temporarily backfilled and maintained with crushed stone or gravel until such time as the sidewalk is constructed or the driveway surface is restored.

D. Method "C" - Backfilling Under Streets, Roads, and Paved & Unpaved Driveways:

Backfilling of pipeline trenches under streets, roads and paved & unpaved driveways shall be accomplished in the following manner:

1. The lower portion of the trench, from the pipe bedding to a point 12 inches above the top of the pipe, shall be backfilled with manufactured sand, as specific in paragraph 3.2. A, hereinbefore. This material shall be placed in a manner approved by the Engineer, and shall be carefully compacted to avoid displacement of pipe. Compaction shall be accomplished by hand-tapping or by approved mechanical methods.

2. The middle portion of the trench from the point above the initial backfill (12" above the pipe) to a point 6" below the bottom of the pavement or concrete sub-slab, shall be backfilled with #57 crushed stone.

3. The upper portion of the trench, from a point 6" below the bottom of the pavement or concrete sub-slab to grade, shall be backfilled with a base course of dense graded aggregate (DGA as defined in the KYTC Standard Specifications for Roads and Bridges). At such time that pavement replacement is accomplished, the excess base course shall be removed as required.

E. Trenches outside existing sidewalks, driveways, streets, and highways shall be backfilled in accordance with Method "A". Trenches within the limits of sidewalks shall be backfilled in accordance with Method "B". Trenches within the paving limits of existing streets, highways and driveways and unpaved driveways shall be backfilled in accordance with Method "C". All methods are shown on the Detail Drawings. When directed by the Engineer, the Contractor shall wet backfill material to assure maximum compaction.

Before final acceptance, the Contractor will be required to level off all trenches or to bring the trench up to grade. The Contractor shall also remove from roadways, rights-of-ways and/or private property all excess earth or other materials resulting from construction.

In the event that pavement is not placed immediately following trench backfilling in streets and highways, the Contractor shall be responsible for maintaining the trench surface in a level condition at proper pavement grade at all times.

3.6 SETTLEMENT OF TRENCHES

A. Whenever lines are in, or cross, driveways and streets, the Contractor shall be responsible for any trench settlement which occurs within these rights-of-way within one (1) year from the time of final acceptance of the work. If paving shall require replacement because of trench settlement within this time, it shall be replaced by the Contractor at no extra cost to the Owner. Repair of settlement damage shall meet the approval of the Owner.

3.7 CONCRETE THRUST BLOCKS, CRADLE, ANCHORS OR ENCASEMENT

A. Concrete thrust blocks, cradle, anchors or encasement shall be placed where shown on the Drawings, required by the Specifications, or as directed by the Engineer.

B. For cradle and encasement, concrete shall be mixed sufficiently wet to permit it to flow under the pipe to form a continuous bed.

C. For thrust blocks and anchors shall be formed or be sufficiently stiff to maintain the forms indicated on the Details.

D. In tamping concrete, care shall be taken not to disturb the grade or line of the pipe or injure the joints. Concrete placed outside the specified limits or without authorization from the Engineer will not be subject to payment.

E. Water mains shall have concrete thrust or "kicker" blocks at all pipe intersections and changes of direction to resist forces acting on the pipeline. All reducers (increasers) shall be anchored.

3.8 BITUMINOUS CONCRETE HIGHWAY, STREET AND DRIVEWAY REPLACEMENT

A. The Contractor shall replace those sections of existing roads, streets and driveways required to be removed to install the pipe lines under this contract. He shall construct same to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than that which existed prior to the operations.

B. Prior to trenching, the pavement shall be scored or cut to straight edges at least twelve (12) inches outside each edge of the proposed trench to avoid unnecessary damage to the remainder of the paving. Edges of the existing pavement shall be re-cut and trimmed to square, straight edges after the pipeline has been installed and prior to placing the new base and pavement.

C. Backfilling of the trench shall be in accordance with Method "C" as described hereinbefore. Base course for the paving shall be dense graded crushed limestone furnished and placed in accordance with the current requirements of the Standard Specifications for Road and Bridge Construction of the Department of Transportation, to a depth of six (6) inches in roads and streets and four (4) inches in driveways.

D. A subslab of reinforced concrete shall be placed for state maintained highways as indicated on the Drawings. The subslab shall have a minimum thickness of 6 inches. Concrete for the subslab shall be 3000 psi, in accordance with the Details shown on the Drawings.

3.9 UNPAVED DRIVEWAY (CRUSHED STONE) SURFACE REPLACEMENT

A. The Contractor shall replace those sections of existing driveways and parking areas required to be removed to install the pipe lines under this contract. He shall construct same to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than that which existed prior to the operations.

B. Material for backfilling of the pipeline trench shall be dense-graded aggregate in accordance with Method "C" as described hereinbefore.

3.10 REMOVING AND REPLACING CONCRETE CURB AND GUTTER OR SIDEWALK

A. The Contractor shall remove the curb and gutter or sidewalk when encountered when required for laying the pipe. Only that portion of the curb and gutter or sidewalk needed to lay the pipe shall be removed.

B. Where concrete curb and gutter or sidewalk is removed or disturbed during the construction work, it shall be replaced, using 3000 psi concrete, in fully as good or better condition than that which existed prior to the Contractor's operation.

3.11 REPLACEMENT OF EXISTING MAIL BOXES, CULVERTS, CLOTHES LINE POSTS, FENCES AND OTHER SUCH FACILITIES

A. Existing mail boxes, drainage culverts, clothes line posts, fences and the like shall not be damaged or disturbed unless necessary, in which case, they shall be replaced in as good condition as found as quickly as possible. Existing materials shall be reused in replacing such facilities when materials have not been damaged by the Contractor's operations. Existing facilities damaged by Contractor's operation shall be replaced with new materials of the same type at the Contractor's expense. Work in this category is not a pay item.

B. Replacement of paved drainage ditches within highway right-of-way shall be accomplished in accordance with Department of Transportation specifications.

3.12 PORTLAND CEMENT CONCRETE DRIVEWAY REPLACEMENT

A. Wherever Portland cement concrete driveways are removed, they shall be reconstructed to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than existed prior to the operation.

B. The existing concrete paving shall be sawed or cut to straight edges 12-inches outside the edges of the trench or broken out to an existing joint, as directed by the Engineer. The concrete pavement shall be equal to the existing pavement thickness but not less than 6-inches in thickness for driveways.

C. Pavement shall be reinforced with 6 x 6 #10-10 wire mesh and shall be constructed with 3000 psi concrete.

3.13 RIP-RAP STREAM BANK SLOPE PROTECTION

A. The Contractor shall install rip-rap stream bank slope protection at locations directed by the Engineer. Rip-rap slope protection shall be 12 inches thick and shall meet State D.O.T. Standard Specifications.

3.14 TESTING

A. All pressure piping (lines not laid to grade) shall be given a hydrostatic test of at least 150 psi, but not to exceed the rated working pressure of the pipe or valves. Note: Engineer shall verify test pressure. Loss of pressure during the test shall not exceed 0 psi in a 4 hour period and 5 psi in a 24 hour period. Any test results that do not meet either of these requirements shall constitute a failure of the pressure test. All pumping equipment and/or plumbing connected to a water system shall be disconnected from the section of piping being tested.

B. No leakage in the pipelines shall be allowed, when tested under the hydrostatic test described above.

C. Contractor shall furnish a recording gauge and water meter for measuring water used during leakage test and recording pressure charts during duration of test. Recording pressure charts shall be turned over to the Engineer at conclusion of tests. The pressure recording device shall be suitable for outside service, with a range from 0-200 psig, 24-hour spring wound clock, designed for 9-inch charts, and shall be approved by the Engineer.

D. Pipelines shall be tested before backfilling at joints except where otherwise required by necessity or convenience.

E. Duration of test shall be not less than four (4) hours where joints are exposed and not less than 24 hours where joints are covered.

F. Where leaks are visible at exposed joints, evident on the surface where joints are covered, and/or identified by isolating a section of pipe, the joints shall be repaired and leakage must be minimized, regardless of total leakage as shown by test.

G. All pipe, fittings, valves, and other materials found to be defective under test shall be removed and replaced at no additional expense to the Owner.

H. Lines which fail to meet tests shall be repaired and retested as necessary until test requirements are complied with.

I. Where nonmetallic joint compounds are used, pipelines should be held under normal operating pressure for at least three days before testing.

J. The Owner will provide initial water for testing the pressure piping. Should the first test fail to pass, all additional water required for subsequent tests shall be furnished at the Contractor's expense.

K. The cost of testing of pressure piping is incidental and is to be included in the Contractor's unit Contract Price.

3.15 CLEAN UP

A. Upon completion of installation of the piping and appurtenances, the Contractor shall remove all debris and surplus construction materials resulting from the Work. The Contractor shall grade the ground along each side of pipe trenches in a uniform and neat manner leaving the construction area in a shape as near as possible to the original ground line.

3.16 DISINFECTION OF POTABLE WATER LINES

A. The new potable waterlines shall not be placed in service--either temporarily or permanently--until they have been thoroughly disinfected in accordance with AWWA Standard C651-05, 2005 and to the satisfaction of the Engineer.

B. After testing, a solution of hypochlorite using HTH or equal shall be introduced into the section of the line being disinfected sufficient to ensure a chlorine dosage of at least 50 ppm in the main. While the solution is being applied, the water should be allowed to escape at the ends of the line until tests indicate that a dosage of at least 50 ppm has been obtained throughout the

pipe. Open and close all valves and cocks while chlorinating agent is in the piping system. The chlorinated water shall be allowed to remain in the pipe for 24 hours, after which a residual of at least 25 ppm shall be obtained. The disinfection shall be repeated until 25 ppm is obtained after which time the main shall be thoroughly flushed until the residual chlorine content is not greater than 1.0 ppm, and then may be connected to the system. Also, no additional payment will be allowed for providing taps for chlorine injection and/or flushing, if necessary. The Contractor is responsible for the disposal of highly chlorinated water flushed from the main.

C. The new water line shall not be put into service until bacteriological samples taken at the points specified herein are examined and shown to be negative after disinfection, following the requirements of "Standard Methods for Examination of Water and Wastewater". One set of acceptable samples shall be collected from the new line. Samples are to be taken and tested at every 1200 feet of new water line, at each branch and at each dead end.

D. If trench water has entered the pipe, or excessive quantities of dirt or debris have entered the pipe, samples shall be taken at intervals of approximately 200 feet and the locations identified. Samples shall be taken of water that has stood in the new line for at least 16 hours after flushing is completed.

E. If the initial disinfection does not produce satisfactory bacteriological results, the new line shall be reflushed and resampled. If samples fail, the line shall be rechlorinated by the continuous feed or slug method until satisfactory results are obtained.

F. All testing documentation shall be submitted to the Owner.

3.17 LAWNS AND GRASSES

A. Provide all labor, materials, and services required for seeding of all disturbed areas caused by construction activities and for installation of sod where indicated on the Contract Drawings or specified herein.

B. Lawns and grasses installation and maintenance shall comply with provisions in KYTC Standard Specifications Section 212.

END OF SECTION 331113

SECTION 331216 – VALVES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment, and services required to furnish and install all valves shown on the Drawings and/or specified herein.

B. Where contradictions exist between LaGrange Utilities Commission Water Specifications and Standard Drawings and the specification below, the LaGrange Utilities Commission specifications and drawings shall govern.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this Section.

B. Piping is specified in Division 33 Specification sections.

1.3 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 013323.

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.

C. In accordance with the requirements of the General and Special Conditions and this Section, the following table includes, but is not limited to, the items required to be submitted:

Item Description	Shop Drawings	Product Data	Schedules	Installation Data	Parts Lists	Wiring Diagram	Samples	O & M Manual	Certificates	Warranty	Report	Other
Valves	X	X			X							
Valve Boxes		X										
Access Manhole	X	X										
Yard Hydrant	X	X			X							
Tapping Sleeve, Valve	X	X		X	X							

PART 2 - PRODUCTS

2.1 GATE VALVES

A. Gate valves shall conform with AWWA C-509 standard, and shall be of the resilient seat type, iron body, fully bronze mounted, non-rising stem and have a design working pressure of 250 psi. All assembly bolts shall be stainless steel. Valves shall be of standard manufacturer and of the highest quality both as to materials and workmanship.

B. All gate valves shall be furnished with mechanical joint connections, unless otherwise shown on the Drawings or specified hereinafter.

C. An epoxy coating conforming to AWWA C-550 shall be applied to the interior and exterior ferrous surfaces of the valve except for finished or seating surfaces.

D. All gate valves shall have the name or monogram of the manufacturer, the year the valve casting was made, the size of the valve, and the working water pressure cast on the body of the valve.

E. Gate valves 12 inches and smaller shall be installed in a vertical position. Gate valves greater than 12 inches shall have the bonnet mounted in the horizontal position and have a bevel gear actuator. Gate valves shall be provided with a 2-inch square operating nut and shall be opened by turning to the left (counter-clockwise). All valve operating nuts shall be set within a cast iron valve box. There shall be a maximum 48-inch depth of valve operating nut. Contractor must use extension stems, if necessary, to raise operator nut within 48 inches of final grade.

F. Gate valves shall be Mueller A2360 or approved equal.

2.2 INSERTION VALVES

A. The Insertion Valve shall consist of three subassemblies: the Valve Body, which shall be mounted pressure tight around the main; the Valve Cartridge, which shall be inserted, under full

line pressure, into the Valve Body; and the Cartridge Closure Flange, which shall secure and permanently seal the Valve Cartridge into the Valve Body. Insertion valves shall be available for installation on 4-inch, 6-inch, 8-inch, 10-inch, 12-inch and 16-inch nominal pipe sizes.

B. Valve Body: The valve body shall consist of a two-part 304L stainless steel tapping saddle with a stainless steel tapping/insertion outlet, welded to the upper half of the saddle. The two part body shall be assembled around the pipe and pressure-sealed to the main by a single griddled resilient sheet gasket and throat gasket. The gasket shall fully encircle the pipe, providing a 360-degree full area seal. Suitable fasteners and supporting lugs shall be provided, as specified below.

1. Saddles shall be fabricated of Type 304L stainless steel. The design of the saddles, bolts, lugs and armor plates shall be such that the saddle halves can be mounted, without further modification, pressure-tight around the pipe. Contractor shall excavate and expose the existing pipe to verify the existing pipe type and size prior to ordering the insertion valve.

2. Bolting lugs shall be Type 304L stainless steel weldments and shall be designed and positioned on the saddle halves to insure accurate assembly of both halves. After assembly around the pipe, the vertical spacing of the bolting lugs between the two saddle halves shall allow adjustment to accommodate the range of pipe diameters specified above.

3. Bolting studs, nuts, along with any formed metal washers shall be fabricated from Type 304 stainless steel. All screw threads shall be 5/8-11UNC-2 (coarse). Nuts shall be heavy series.

4. Sheet Gasket shall be molded from a virgin SBR elastomer compound that will resist compression set and is compatible with cold drinking water in the normal 32 to 120 degrees. A griddled ("waffle") pattern shall be molded on the inner side of the gasket. Each side (which lies parallel to the run of the pipe) of the Gasket shall be tapered to allow uniform distribution of clamping (gasket) pressure over the entire circumference of the pipe. A stainless steel Armor Plate shall be attached to each side of the Gasket to bridge the gap between the saddle halves.

5. The tapping/insertion outlet on the upper saddle half shall be fabricated from Type 304 stainless steel, and shall have a flange welded to the outlet neck with locking pins to mate with the top groove of the Stuffing Box Plate (which is part of the Valve Cartridge). Below these locking pins, the interior of the outlet shall be accurately bored to seal against the O-ring contained in the stuffing box plate. The bore shall be further machined to provide a shoulder to vertically locate the Valve Cartridge when it is inserted into the Body. Two opposing rectangular keyways shall be machined into the interior wall of the outlet to receive the guide keys on the Valve Cartridge carrier.

C. The Valve Cartridge shall consist of a stuffing box plate, valve stem with operating nut, valve plugging head that shall consist of a carrier with an internal deformable sealing element and two external resilient sealing sleeves, and ancillary parts and fasteners. This cartridge shall be inserted into the outlet under full line pressure by means of a Cartridge Inserter.

1. The stuffing box plate shall retain the collar of the valve stem against the cartridge closure flange to prevent vertical motion during normal operation of the Insertion Valve. Suitable thrust washers shall be installed above and below the stem collar.

    a. The bore of this plate shall provide a pressure sealing surface for o-rings mounted on the valve stem.
    b. The exterior of this plate shall be grooved to receive locking pins installed from the nozzle flange after plate has been inserted into the nozzle and has seated against the internal nozzle shoulder. Below this pin groove, the plate shall be further machined to accept an o-ring to provide a pressure-seal between the exterior of the plate and the bore of the nozzle.

2. Valve Stem: The stem shall be machined from 304 stainless steel with a 700 LB torque capacity. During normal operation of the Insertion Valve, rotation of the stem shall advance the valve carrier with sealing devices into the fully closed position to stop flow in the pipe. Reversal of stem rotation shall retract the carrier into the completely open position, allowing full flow through the main.

    a. The Owner shall specify the valve stem to be machined to open the valve by turning it clockwise (open right) or counter clockwise (open left), prior to ordering.
    b. The top the stem shall be provided with a detachable, 2-inch square operating nut.
    c. Valve shall be operated at 3 turns per inch for 4 inches through 16 inches.

3. The valve plugging head shall consist of two major components: rigid cylindrical carrier and three elastomer sealing devices, along with connecting parts and fasteners.

    a. The carrier shall be a rigid, solid cylinder, turned to provide clearance to enter the access (tapped) hole in the pipe. A vertical central slot shall be machined into the lower portion of the carrier. This slot shall contain a single flat deformable sealing element. The carrier shall consist of a solid CM-909 body with rubber coating on the middle half of the CM-909 body.
    b. The bottom of carrier shall be hemispherical to generally conform to the bore of the pipe. It shall be designed to break and to dislodge tuberculation and other deposits that might interfere with a suitable shutdown.
    c. The carrier top, above the slot, shall contain an internal stainless steel thread to mate with that on the valve stem. Suitable mechanical means shall be provided to attach the deformable element to the carrier to insure retraction upon opening.
    d. Rectangular guide keys shall be inserted to the top of the carrier. These keys shall be positioned to engage with and slide in the keyways machined into the interior walls of the outlet. This action shall maintain alignment of the valve cartridge when the Insertion Valve Plus is operated.
    e. A single deformable sealing element shall be contained inside the slot in the carrier. The element shape shall be generally flat with the lower end semi-circular to seal the bottom of the pipe. The carrier shall deform that element into sealing contact with the pipe wall when the Insertion Valve is closed.
    f. A resilient sleeve shall be attached to each of the two vertical cylindrical sides of the carrier. When the Insertion Valve is closed, these two sleeves shall seal against the deformable element and those surfaces of the pipe not sealed by the element, thereby completing the shutdown.

D. The cartridge closure flange with a flat flange gasket shall be used to complete the installation of the Insertion Valve. After the stuffing box plate has been seated on the shoulder in the outlet and the lock screws have been tightened from the outlet Flange, the Valve Cartridge shall be mechanically secure in the Valve Body. All water leakage paths shall be sealed. A Stem o-ring shall pressure-seal against a bored hole in the closure flange. The flange shall then be bolted to the outlet flange, followed by installation of the valve operating nut.

E. The Insertion shall be Insta-Valve Plus as manufactured by Hydra-Stop, Alsip, Il. The Insta-Valve Plus does not guarantee a 100% shutdown due to unknown factors within the pipe. The Insta-Valve Plus shall be rated to 150 PSI working pressure and 225 PSI test pressure.

2.3 VALVE BOXES - BURIED VALVES (EXCEPT AIR RELEASE AND SEWAGE COMBINATION VALVES)

A. Valve boxes shall be of 5-1/4 inch standard cast iron, two-piece, screw type valve box with drop cover marked "WATER", "SEWER", "DRAIN", as applicable. Valve boxes for gate valves larger than 8 inches shall be three-piece. Valve boxes shall be accurately centered over valve operating nut, and backfill thoroughly tamped about them. Valve boxes shall not rest on the valves but shall be supported on crushed stone fill. They shall be set vertically and properly cut and/or adjusted so that the tops of boxes will be at grade in any paving, walk or road surface, and in grass plots, fields, woods or other open terrain. Valve boxes and covers shall be as manufactured by Tyler Corporation, Opelika Foundry, or equal.

B. Contractor shall furnish two (2) 6-foot T-handle operating wrenches for underground valves. Nut operator extensions for all valves buried deeper than 3 feet shall be provided with stem extensions sufficient to raise operator nut to within 3 feet of finished grade.

C. Valve boxes shall have extension stems, where necessary when operating nut is raised to be within 4 feet of the existing grade.

D. Wherever valve boxes fall outside of the pavement, the top of the box shall be set in a cast-in-place concrete slab 18 inches x 18 inches x 4 inches thick with the top of the slab and box flush with the top of the ground. This provision shall apply to all new and all existing valve boxes which fall within the limits of the contract, unless otherwise stated on the plans or ordered by the Engineer.

2.4 TAPPING SLEEVES AND VALVES

A. SST tapping sleeves for use in connections to existing water lines, where indicated on the drawings or as directed by the Engineer, shall have the body and neck constructed of ASTM A-240 type 304 stainless steel and shall be compressed to the carrier pipe by use of heavy gauge triangular sidebars running the length of the body. Bolts, nuts and washers shall be constructed of type 304 stainless steel. The gasket between the tapping sleeve and carrier pipe shall be constructed of Buna N rubber and be NSF 61 approved. The gasket shall have a grid pattern to help secure it in place and have seal around the full circumference of the pipe. Tapping outlet connections shall be constructed of ductile iron conforming to ASTM A-536 and have either a mechanical joint connection conforming to AWWA C-111, or a flanged connection with drillings in accordance with ANSI class 125#/150#. Tapping Sleeves shall be suitable for the following working pressures: 4-inch to 12-inch 250 psi, 14-inch to 24-inch 200 psi and shall be Ford Tapping Sleeves Style FAST or approved equal.

B. Tapping valves shall meet the requirements of paragraph 2.01 hereinbefore and shall be coordinated to connect to the tapping sleeve with either a flanged end or a mechanical joint end. Tapping gate valves shall be Mueller T2360 or approved equal.

C. All existing water mains to be tapped under this contract shall be exposed in order to verify line sizes prior to ordering tapping sleeves and valves.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All valves shall be installed in accordance with details on the Contract Drawings and with the manufacturer's recommendations.

B. All valves shall be anchored in accordance with the details on the Contract Drawings.

END OF SECTION 331216

SECTION 331219 - HYDRANTS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment and services required for furnishing and installing all hydrants and appurtenances specified herein.

B. Where contradictions exist between LaGrange Utilities Commission Water Specifications and Standard Drawings and the specification below, the LaGrange Utilities Commission specifications and drawings shall govern.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork: Section 312000

B. Valves - Utilities Services: Section 331216

C. Water Distribution Piping: Section 331113

1.3 SUBMITTALS

A. Submit shop drawings and product data in accordance with Section 013323 of this specification.

B. 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.

C. In accordance with the requirements of the General and Special Conditions and this Section, the following table includes, but is not limited to, the items required to be submitted:

Item Description	Shop Drawings	Product Data	Schedules	Installation Data	Parts Lists	Wiring Diagram	Samples	O & M Manual	Certificates	Warranty	Report	Other
Hydrants	X	X		X	X							

PART 2 - PRODUCTS

2.1 FIRE HYDRANTS

A. The Contractor shall furnish and install fire hydrants and auxiliary gate valves where shown on the Drawings or directed by the Engineer. Hydrants shall conform in all respects to the most recent requirements of AWWA C502. Hydrant barrel shall have safety breakage feature above the ground line. All hydrants shall have 6-inch mechanical joint shoe connection and two (2) 4 1/2-inch pumper nozzle with rubber gasketed caps fitted with cap chains. Cap nuts are to be five (5) sided. Connection threads shall be National Standard Thread. Main valve shall have 5-1/4-inch full opening and be of the compression type opening against water pressure so that valve remains closed should barrel be broken off.

B. Hydrants shall be fully bronze mounted. Main valve shall have a threaded bronze seat ring assembly of such design that it is easily removable by unscrewing from a threaded bronze drain ring. Bronze drain ring shall have multiple ports providing positive automatic drainage as the main valve is opened or closed. Drainage waterways shall be completely bronze to prevent rust and corrosion.

C. The operating nut shall be five (5) sided bronze or bronze with a five (5) sided ductile iron cap, and mounted so that a counter clockwise motion will open the valve. There must be cast on top an arrow and the word "Open" indicating the direction of turn to open the hydrant.

D. Operating stem shall be equipped with anti-friction thrust bearing to reduce operating torque and assure easy opening. Stop shall be provided to limit stem travel. Stem threads shall be enclosed in a permanently sealed lubricant reservoir protected from weather and the waterway with O-ring seals.

E. Hydrants shall be shop tested to 300 psi pressure with the main valve both opened and closed. Under the test the valve shall not leak, the automatic drain shall function and there shall be no leakage into the bonnet.

F. Type of shoe connection shall be mechanical joint and size shall be six inches (6").

G. Hydrants shall be given two (2) coats of enamel high visibility (YELLOW) paint to be selected by the Owner.

H. Hydrants shall be Mueller Super Centurion Model A-425 or approved equal.

PART 3 - EXECUTION

3.1 SETTING OF FIRE HYDRANTS

A. Location:

1. Hydrants shall be located as shown or as directed so as to provide complete accessibility and minimize the possibility of damage from vehicles or injury to pedestrians.

2. When placed behind the curb, the hydrant barrel shall be set so that the pumper or hose nozzle cap will be a minimum of 5 feet from the back of curb.
3. When set in the lawn space between the curb and the sidewalk or between the sidewalk and the property line, no portion of the hydrant or nozzle cap shall be within 6 inches of the sidewalk.

B. Position:

1. All hydrants shall be set plumb with not less than two (2) cubic feet of crushed stone and shall have their nozzles parallel with the roadway, with the pumper nozzle facing toward the roadway. Hydrants shall be set to the established grade, with nozzles at least 18 inches above the ground, as shown or as directed by the Engineer.

C. Connection to Main:

1. Each hydrant shall be connected to the main with a 6-inch restrained joint ductile iron branch controlled by an independent 6-inch gate valve, unless otherwise specified.

D. Hydrant Drainage in Pervious Soil:

1. Whenever a hydrant is set in soil that is pervious, drainage shall be provided at the base of the hydrant by placing uncrushed coarse aggregate (AAHSTO M-43) No. 57 from the bottom of the trench to at least 6 inches above the drain opening in the hydrant and to a distance of 1 foot around the elbow. No drainage system shall be connected to a sewer.

E. Hydrant Drainage in Impervious Soil:

1. Whenever a hydrant is set in clay or impervious soil, a drainage pit 2 feet in diameter and 3 feet deep shall be excavated below each hydrant and filled compactly with uncrushed coarse aggregate (AASHTO M-43) No. 57 under and around the elbow of the hydrant and to a level of six inches (6") above the drain opening. No drainage pit shall be connected to a sewer (see Standard Details).

3.2 ANCHORAGE

A. The bowl of each hydrant shall be tied to the pipe with suitable anchor couplings, as shown on the Standard Details in the Drawings or as directed by the Owner or Engineer.

3.3 FIRE HYDRANT WRENCHES

A. One (1) hydrant wrench shall be furnished for each ten (10) hydrants or less. When the number of hydrants furnished and installed exceeds twenty-five (25), one (1) hydrant repair kit shall be supplied at no additional cost to the Owner.

END OF SECTION 331219

SECTION 333413 – SEWAGE FORCE MAINS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment and services required for furnishing and installing all piping and appurtenances specified herein.

B. Where contradictions exist between LaGrange Utilities Commission Sanitary Sewer Specifications and Standard Drawings and the specification below, the LaGrange Utilities Commission specifications and drawings shall govern.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork Section 312000

B. Valves - Site Utilities: Section 331216

1.3 SUBMITTALS

A. Submit manufacturer's data and shop drawings for all materials and as specified herein. Comply with all requirements of Section 013323.

B. A notarized certification shall be furnished for all pipe and fittings that verifies compliance with all applicable specifications. The requirement for this certification does not eliminate the need for shop drawings submittals in compliance with Section 013323.

C. In accordance with the requirements of the General and Special Conditions and this Section, the following table includes, but is not limited to, the items required to be submitted:

Item Description	Shop Drawings	Product Data	Schedules	Installation Data	Parts Lists	Wiring Diagram	Samples	O & M Manual	Certificates	Warranty	Report	Other
Pipe	X	X		X					X			
Fittings	X	X		X								
Detectable Tape	X	X		X								
Trench Baffles	X	X		X								

1.4 UTILITY LINE ACTIVITIES COVERED UNDER NATIONWIDE PERMIT # 12

All activities involving utility line construction covered under NATIONWIDE PERMIT # 12 shall meet the following conditions:

A. The general Water Quality Certification is limited to the crossing of intermittent and perennial streams by utility lines.

B. The construction of permanent or temporary access roads will impact less than 300 linear feet of intermittent and perennial streams and less than one acre of jurisdictional wetlands.

C. Utility lines shall be located at least 50 feet away from a stream which appears as a blue line on a USGS 7 ½ minute topographic map except where the utility line alignment crosses the stream. Utility lines that cross streams shall be constructed by methods that maintain normal stream flow and allow for a dry excavation. Water pumped from the excavation shall be contained and allowed to settle prior to re-entering the stream. Excavation equipment and vehicles shall operate outside of the flowing portion of the stream. Spoil material from the utility line excavation shall not be allowed to enter the flowing portion of the stream.

D. The activities shall not result in any permanent changes in preconstruction elevation contours in waters or wetlands or stream dimension, pattern or profile.

E. Utility line construction projects through jurisdictional wetlands shall not result in conversion of the area to non-wetland status.

F. Measures shall be taken to prevent or control spills of fuels, lubricants, or other toxic materials used in construction form entering the watercourse.

G. Removal of riparian vegetation in the utility line right-of-way shall be limited to that necessary for equipment access. Effective erosion and sedimentation control measures must be employed at all times during the project to prevent degradation of waters of the Commonwealth. Site regarding and reseeding will be accomplished with 14 days after disturbance.

H. To the maximum extent practicable, all in-stream work under this certification shall be performed during low flow.

I. Heavy equipment, e.g. bulldozers, backhoes, draglines, etc., if required for this project, should not be used or operated within the stream channel. In those instances where such in-stream work is unavoidable, then it shall be performed in such a manner and duration as to minimize turbidity and disturbance to substrates and bank or riparian vegetation.

J. Any fill shall be of such composition that it will not adversely affect the biological, chemical, or physical properties of the receiving waters and/or cause violations of water quality standards. If riprap is utilized, it is to be of such weight and size that bank stress or slump conditions will not be created because of its placement.

K. Removal of existing riparian vegetation should be restricted to the minimum necessary for project construction.

L. Should evidence of stream pollution or jurisdictional wetland impairment and/or violations of water quality standards occur as a result of this activity (either from a spill or other forms of

water pollution), the Kentucky Division of Water shall be notified immediately by calling 800/928-2380.

1.5 CONSTRUCTION IN A FLOODPLAIN

A. No material shall be placed in the stream or in the flood plain to form construction pads, coffer dams, access roads, etc. unless prior approval has been obtained from the Environmental and Public Protection Cabinet.

B. The trench shall be backfilled as closely as possible to the original contour. All excess material from construction of the trench shall be disposed of outside the flood plain unless the applicant has received prior approval from the Cabinet to fill within the flood plain.

PART 2 - PRODUCTS

2.1 MOLECULARLY ORIENTED POLYVINYL CHLORIDE (PVCO) PRESSURE PIPE

A. PVCO pipe shall be Ultra Blue as manufactured by JM Eagle, Los Angeles, CA or approved equal. PVCO pipe shall conform to AWWA C909 (Iron Pipe Size OD).

B. AWWA C-909 Ultra Blue (Outside Diameter compatible with Iron Pipe Size)

1. 6-inch through 12-inch - PVCO plastic pipe shall conform to ANSI/AWWA C-909, Pressure Class 200, Ultra Blue. PVC pipe shall have a maximum laying length of 20 feet, with bell end and elastomeric gasket, and with plain end for IPS ductile-iron fittings. Elastomeric gasket shall conform with the requirements of ASTM F-477. The seal of the National Sanitation Foundation Testing Laboratory must appear on each pipe.

C. Fittings shall be pressure class 350 ductile iron and have mechanical-joint ends in accordance with ANSI/AWWA C153/A21.53, latest revision. Compact ductile iron fittings shall conform to the details and dimensions shown therein. Fittings shall have interior cement-mortar lining as specified hereinbefore for the pipe. Full bodied fittings per ANSI/AWWA C110/A21.10, latest revision will also be acceptable. Restrain Joint is required on all mechanical joint fittings.

D. The basis of acceptance of PVC plastic force main pipe will be a written, notarized certification, accompanied by a copy of test results, that the pipe and pipe material has been sampled, tested and inspected in accordance with the designated standard specifications. These certifications shall be obtained from the manufacturer and delivered to the Engineer’s or Owner’s representative on the project site. A sufficient number of tests and certifications shall be made so as to be representative of the complete project. Copies of the test results shall be kept on file by the manufacturer and shall be available for review by the Engineer or Owner upon request.

E. Pipe shall be visually inspected on the project site for proper markings which shall include manufacturer’s name or trademark, nominal pipe size, pressure rating for water at 73.4 degrees F., plastic pipe material designation code (e.g. PVC 1120), dimension ratio, AWWA or ASTM designation and pressure class with which the pipe complies, and the National Sanitation Foundation NSF 14 Seal of Approval for drinking water.

Standard Dimension Ratio SDR-21 (200 psi)

2.2 POLYVINYL CHLORIDE (PVC) PLASTIC PRESSURE PIPE

A. PVC Pressure Pipe, 3 inches and Smaller: Polyvinyl chloride plastic pipe shall be ASTM D 1785 Schedule 40 with solvent weld joints. Fittings shall be ASTM D 2466 Schedule 40 socket type. All socket type connections shall be made with PVC solvent cement complying with ASTM D 2564. PVC solvent cement shall be furnished from the same supplier as the PVC pipe. Provide socket-threaded adapters for connection to threaded appurtenances where required.

B. Fittings for the pipe shall be constructed of the same plastic material as is used for the pipe, minimum 200 psi pressure rating, gasketed and shall be of the molded type or machined from extruded stock.

C. Joints for polyvinyl chloride (PVC) mains shall be integral bell and spigot type joints with rubber O-ring gasket. The cleaning and assembling of the pipe joints shall be in accordance with manufacturer's recommendations.

2.3 COUPLING AND ADAPTORS

A. Flexible couplings shall be of the sleeve type with a middle ring, two wedge shaped resilient gaskets at each end, two follower rings, and a set of steel trackhead bolts. The middle ring shall be flared at each end to receive the wedge portion of the gaskets. The follower rings shall confine the outer ends of the gaskets, and tightening of the bolts shall cause the follower rings to compress the gaskets against the pipe surface, forming a leak-proof seal. Flexible couplings shall be steel with minimum wall thickness of the middle ring or sleeve installed on pipe being 5/16-inch for pipe smaller than 10 inches, 3/8-inch for pipe 10 inches or larger. The minimum length of the middle ring shall be 5-inches for pipe sizes up to 10 inches and 7 inches for pipe 10 inches to 30 inches. The pipe stop shall be removed. Gaskets shall be suitable for 250 psi pressure rating or at rated working pressure of the connecting pipe. Couplings shall be harnessed and be designed for 250 psi.

B. Flanged adapters shall have one end suitable for bolting to a pipe flange and the other end of flexible coupling similar to that described hereinbefore. All pressure piping with couplings or adapters shall be harnessed with full threaded rods spanning across the couplings or adapters. The adapters shall be furnished with bolts of an approved corrosion resistant steel alloy, extending to the adjacent pipe flanges. Flanges on flanged adapter (unless otherwise indicated or required) shall be faced and drilled ANSI B16.1 Class 125.

C. Flexible couplings and flanged adapters shall be as manufactured by Dresser, Smith-Blair, or equal, per the following, unless otherwise specified and/or noted on the Drawings:

D. Steel couplings for joining same size, plain-end, steel, cast iron, and PVC plastic pipe -

Dresser	Smith-Blair
Style 138	4ll

E. Transition couplings for joining pipe of different outside diameters-

Dresser	Smith-Blair
Style 162 (4"-12")	413 steel (2"-24")
Style 62 (2"-24")	415 steel (6"-48")

F. Flanged adapters for joining plain-end pipe to flanged pipe, fittings, valves and equipment.

Dresser	Smith-Blair
Style 128 steel (3" 48" C.I. Pipe)	912 cast (3"-12")
Style 128 steel (2" 96" steel pipe)	913 steel (3" and larger)

2.4 DETECTABLE UNDERGROUND UTILITY WARNING TAPES

A. Detectable underground utility warning tapes which can be located from the surface by a non-ferrous metal detector and shall be installed directly above nonmetallic (PVC, polyethylene, concrete) pipe.

B. The tape shall be a 5.0 mil tape with a 4.5 mil solid aluminum core in a protective polyethylene jacket that is impervious to all know alkalis, acids, chemical reagents and solvents found in the soil.

C. The minimum overall thickness of the tape shall be 5.0 mils and the width shall not be less than 2" wide. Tape width shall be dictated by sewer line burial depth. The tape shall be color coded and imprinted with the legend as follows:

Type of Utility	Color Code	Legend
Sewer	Green	Caution Buried Sewer Line Below

D. Detectable underground tape shall be “Underground Tape” as manufactured by Brimar, or approved equal.

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

F. Payment for detectable tapes shall be included in the linear foot price bid of the appropriate bid item(s) unless it is listed as a separate payment item in the bid schedule.

2.5 TRACER WIRE

A. Tracer wire shall be 12-gauge copperhead wire with 30-mil polyethylene jacket. Tracer wire shall be installed with all buried piping, “duct” taped to top of pipe. Tracer wire shall be secured to the top of the pipe by tape a minimum of 3 times on each standard length of pipe.

B. Split Bolt connectors are required when connecting two (2) pieces of tracer wire. Wire and connector shall be wrapped with electrical tape.

C. Tracer wire shall be brought up into locator boxes with grounding devices. Locator boxes shall be valve boxes with a polystyrene donut that fits around the box to serve as a termination point

for tracer wire. Locator boxes shall be installed at a maximum of 500 linear feet apart, or where shown on the Drawings.

D. Payment for tracer wire and boxes shall be included in the linear foot price bid of the appropriate bid item(s) unless it is listed as a separate payment item in the bid schedule

2.6 CONCRETE PIPE ANCHORS, THRUST BLOCKS, CRADLE OR ENCASEMENT

A. Where indicated on the Drawings, required by the Specifications or as directed by the Engineer, concrete pipe anchors, thrust blocks, cradles or encasements shall be installed.

B. Concrete shall comply with provisions in KYTC Standard Specifications Section 601 and be Class B. Reinforcing bars shall be installed as indicated on the details.

2.7 PREFABRICATED TRENCH BAFFLES

A. Where indicated on the Drawings, required by the specifications, or as directed by the Engineer, Contractor shall install pre-fabricated trench baffles in the pipeline trench. The Baffle shall be self-supporting, made of ABS (Acrylonitrile Butadiene Styrene) or comparable material, and shall provide a watertight seal around the pipe by use of an elastomeric PVC flexible coupling. The purpose of the baffle is to stop the flow of groundwater along the trench, and around the pipe. The trench baffle shall be “Ripley’s Dam” as manufactured by EJP, or equal.

PART 3 - EXECUTION

3.1 EXCAVATION FOR PIPELINE TRENCHES

A. Unless otherwise directed by the Engineer, trenches in which pipes are to be laid shall be excavated in open cut to the depths required by field conditions or as specified by the Engineer. In general this shall be interpreted to mean that machine excavation in earth shall not extend below an elevation permitting the pipe to be properly bedded. Installation shall be in accordance with ASTM-D-2321 except as modified herein.

B. If the foundation is good firm earth and the machine excavation has been accomplished as set out hereinbefore, the remainder of the material shall be excavated by hand, then the earth pared or molded to give full support to the lower quadrant of the barrel of each pipe. Where bell and spigot is involved, bell holes shall be excavated during this latter operation to prevent the bells from being supported on undisturbed earth. If for any reason the machine excavation in earth is carried below an excavation that will permit the type of bedding specified above, then a layer of granular material shall be placed so that the lower quadrant of the pipe will be securely bedded in compact granular fill.

C. Excavation may be undercut to a depth below the required invert elevation that will permit laying the pipe in a bed of granular material to provide continuous support for the bottom quadrant of the pipe. When this method is used, the bedding shall be as set out in Paragraph 3.02 hereinafter.

D. Trenches shall be of sufficient width to provide free working space on each side of the pipe and to permit proper backfilling around the pipe, but unless specifically authorized by the Engineer, trenches shall in no case be excavated or permitted to become wider than 2 feet plus the nominal diameter of the pipe at the level of or below the top of the pipe. If the trench does become wider than 2 feet at the level of or below the top of the pipe, special precaution may be necessary, such as providing compacted, granular fill up to top of the pipe or providing pipe with additional crushing strength as determined by the Engineer after taking into account the actual trench loads that may result and the strength of the pipe being used. The Contractor shall bear the cost of such special precautions as are necessary.

E. All excavated materials shall be placed a minimum of 2 feet back from the edge of the trench.

F. Before laying the pipe, the trench shall be opened far enough ahead to reveal obstructions that may necessitate changing the line or grade of the pipeline.

G. The trench shall be straight and uniform so as to permit laying pipe to lines and grades given by the Engineer. It shall be kept free of water during the laying of the pipe and until the pipeline has been backfilled. Removal of trench water shall be at the Contractor's expense. Dry conditions shall be maintained in the excavations until the backfill has been placed. During the excavation, the grade shall be maintained so that it will freely drain and prevent surface water from entering the excavation at all times. When directed by Owner, temporary drainage ditches shall be installed to intercept or direct surface water which may affect work. All water shall be pumped or drained from the excavation and disposed of in a suitable manner without damage to adjacent property or to other work.

H. Minimum cover of 30 inches shall be provided for all pipelines, except those located in the State Highway Right of Way. Those shall have a minimum cover of 42 inches.

3.2 PIPE BEDDING

A. All sewer pipe shall be supported on a bed of granular material unless the trench has been prepared in accordance with Paragraph 3.1B. In no case shall pipe be supported directly on rock. Bedding shall not be a separate pay item unless otherwise set out in the Detailed Specifications. Bedding shall be provided in earth bottom trenches, as well as rock bottom trenches. Bedding material shall be free from large rock, foreign material, frozen earth, and shall be acceptable to the Engineer. Bedding shall be a minimum of 6" below pipe barrel. See LUC Specifications for additional pipe bedding requirements.

B. In all cases the foundation for pipes shall be prepared so that the entire load of the backfill on top of the pipe will be carried on the barrel of the pipe so that none of the load will be carried on the bells.

C. Where flexible pipe is used, the bedding shall be placed up to at least the spring line (horizontal center line) of the pipe. The bedding material and procedures shall conform to ASTM D 2321 and any Technical Specifications set out hereinafter. If conditions warrant, the Engineer may require the bedding to be placed above the springline of the pipe. Granular bedding shall be Size #9-m or ASTM C 33, Size #7 crushed stone, fine gravel, or sand, and is not a separate pay item.

D. Where undercutting and granular bedding is involved it shall be of such depth that the bottom of the bells of the pipe will be at least three inches above the bottom of the trench as excavated. Undercutting is not a separate pay item.

E. In wet, yielding mucky locations where pipe is in danger of sinking below grade or floating out of line or grade, or where backfill materials are of such a fluid nature that such movements of the 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. When ordered by the Engineer, yielding and mucky materials in subgrades shall be removed below ordinary trench depth in order to prepare a proper bed for the pipe. Crushed stone or other such granular material, if necessary, as determined by the Engineer to replace poor subgrade material, shall be a separate pay item and classified as "Fill". Removal of poor material is not a separate pay item.

F. Installation shall be in accordance with ASTM D 2321 except as modified hereinafter.

3.3 SPECIAL GRANULAR FILL

A. As noted in Paragraph 3.2E, granular material for "Special Granular Fill" when directed by the Engineer shall be Department of Transportation crushed limestone, Size #57. Payment for "Special Granular Fill" must have approval from the Engineer prior to installation.

3.4 LAYING PIPE

A. The laying of pipe in finished trenches shall be commenced at the lowest point so the spigot ends point in the direction of flow.

B. All pipes shall be laid with ends abutting and true to line and grade as given by the Engineer. Supporting of pipes shall be as set out hereinbefore under "Pipe Bedding" and in no case shall the supporting of pipes on blocks be permitted.

C. Before each piece of pipe is lowered into the trench, it shall be thoroughly inspected to insure it’s being cleaned. Each piece of pipe shall be lowered separately unless special permission is given otherwise by the Engineer. 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, they shall be removed and replaced with a satisfactory pipe or fitting without additional charge. 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.

D. Pipe shall not be laid on solid rock. A pad of granular material as specified in Paragraph 3.02 "Pipe Bedding", shall be used as a pipe bedding. Pipe bedding is not a separate pay item. Irregularities in subgrade in an earth trench shall be corrected by use of granular material.

E. When ordered by the Engineer, unsuitable materials in subgrades shall be removed below ordinary trench depth in order to prepare a proper bed for the pipe.

F. When laying of pipe is stopped for any reason, the exposed end of such pipe shall be closed with a plywood or fabricated plug fitted into the pipe bell, so as to exclude earth or other material, and precautions taken to prevent flotation of pipe by runoff into trench.

G. No backfilling (except for securing pipe in place) over pipe will be allowed until the Engineer has had an opportunity to make an inspection of the joints, alignment and grade, in the section laid.

3.5 BACKFILLING PIPELINE TRENCHES

A. Backfilling of pipeline trenches shall be accomplished with the requirements set forth in Earthwork - Section 312000 as shown on the Drawings and with details set forth hereinafter.

B. Method "A" - Backfilling in Open Terrain:

Backfilling of pipeline trenches in open terrain shall be accomplished in the following manner:

1. The lower portion of the trench, from the pipe bedding to a point 12" above the top of the pipe, shall be backfilled with material free from rock and/or material acceptable to the Engineer. This material shall be placed in a manner approved by the Engineer and shall be carefully compacted to avoid displacement of the pipe.

    a. Compaction shall be accomplished by hand-tamping or by approved mechanical methods.

2. The upper portion of the trench above the compacted portion shall be backfilled with material which is free from large rock. Incorporation of rock having a volume exceeding one-half cubic foot is prohibited. Backfilling this portion of the trench may be accomplished by any means approved by the Engineer. The trench backfill shall be heaped over or leveled as directed by the Engineer.

C. Method "B" - Backfilling Under Sidewalks & Unpaved Driveways:

Backfilling of pipeline trenches under sidewalks and unpaved driveways shall be accomplished in the following manner.

1. The lower portion of the trench, from the pipe bedding to a point 12 inches above the top of the pipe, shall be backfilled with material free from rock, and acceptable to the Engineer or with crushed stone as specified in "Pipe Bedding". This material shall be placed in a manner to avoid displacement of the pipe. Compaction shall be accomplished by hand-tapping or by approved mechanical methods.
2. The middle portion of the trench, from a point 12 inches above the top of the pipe to a point 6" below the grade line, shall be backfilled with material free from large rock and acceptable to the Engineer. This material shall be placed and compacted in layers of approximately 6 inches. Water (puddling) may be used as required to obtain maximum compaction.

    a. Upon approval of the Engineer, the Contractor may backfill the middle portion of the trench with crushed stone, fine gravel, or sand in lieu of materials which require compaction.

3. The upper portion of the trench shall be temporarily backfilled and maintained with crushed stone or gravel until such time as the sidewalk is constructed or the driveway surface is restored.

D. Method "C" - Backfilling Under Streets, Roads, and Paved Driveways:

Backfilling of pipeline trenches under streets, roads and paved driveways shall be accomplished in the following manner:

1. The lower portion of the trench from the pipe bedding to a point 6 inches below the bottom of the pavement or concrete sub-slab, shall be backfilled with # 9 crushed stone.
2. The upper portion of the trench, from a point 6 inches below the bottom of the pavement or concrete sub-slab to grade, shall be backfilled with a base course of dense graded aggregate. At such time that pavement replacement is accomplished, the excess base course shall be removed as required.

E. Trenches outside existing sidewalks, driveways, streets, and highways shall be backfilled in accordance with Method "A". Trenches within the limits of sidewalk and unpaved driveways shall be backfilled in accordance with Method "B". Trenches within the paving limits of existing streets, highways and driveways shall be backfilled in accordance with Method "C". All methods are shown on Sheet SD-2 of the Drawings. When directed by the Engineer, the Contractor shall wet backfill material to assure maximum compaction.

F. Before final acceptance, the Contractor will be required to level off all trenches or to bring the trench up to grade. The Contractor shall also remove from roadways, rights-of-ways and/or private property all excess earth or other materials resulting from construction.

G. In the event that pavement is not placed immediately following trench backfilling in streets and highways, the Contractor shall be responsible for maintaining the trench surface in a level condition at proper pavement grade at all times.

3.6 SETTLEMENT OF TRENCHES

A. Whenever lines are in, or cross, driveways and streets, the Contractor shall be responsible for any trench settlement which occurs within these rights-of-way within one year from the time of final acceptance of the work. If paving shall require replacement because of trench settlement within this time, it shall be replaced by the Contractor at no extra cost to the Owner. Repair of settlement damage shall meet the approval of the Owner and/or the State Department of Transportation.

3.7 CONCRETE THRUST BLOCKS, CRADLE, ANCHORS OR ENCASEMENT

A. Concrete thrust blocks, cradle, anchors or encasement shall be placed where shown on the Drawings, required by the specifications, or as directed by the Engineer.

B. For cradle and encasement, concrete shall be 2000 psi and shall be mixed sufficiently wet to permit it to flow under the pipe to form a continuous bed.

C. For thrust blocks and anchors, concrete shall be 2000 psi, and shall be formed or be sufficiently stiff to maintain the forms indicated on the Details.

D. When tamping concrete, care shall be taken not to disturb the grade or line of the pipe or injure the joints. Concrete placed outside the specified limits or without authorization from the Engineer will not be subject to payment.

3.8 BITUMINOUS CONCRETE HIGHWAY, STREET AND DRIVEWAY REPLACEMENT

A. The Contractor shall replace those sections of existing roads, streets and driveways required to be removed to install the pipelines under this contract. He shall construct same to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than that which existed prior to the operations.

B. Prior to trenching, the pavement shall be scored or cut to straight edges at least 12 inches outside each edge of the proposed trench to avoid unnecessary damage to the remainder of the paving. Edges of the existing pavement shall be re-cut and trimmed to square, straight edges after the pipeline has been installed and prior to placing the new base and pavement.

C. Backfilling of the trench shall be in accordance with Method "C" as described hereinbefore. Base course for the paving shall be dense graded crushed limestone furnished and placed in accordance with the current requirements of the Standard Specifications for Road and Bridge Construction of the Department of Transportation, to a depth of 6 inches in roads and streets and 4 inches in driveways.

D. A subslab of reinforced concrete shall be placed for state-maintained highways as indicated on the Drawings. The subslab shall have a minimum thickness of 6 inches. Concrete for the subslab shall be 2500 psi, in accordance with the Details shown on the Drawings.

3.9 REMOVING AND REPLACING CONCRETE CURB AND GUTTER

A. The Contractor shall remove the curb and gutter when encountered when required for laying the sewer. Only that portion of the curb and gutter needed to lay the sewer line shall be removed. Where concrete curb and gutter removed or disturbed during the construction work, it shall be replaced, using 3000 psi concrete, in fully as good or better condition than which existed prior to the Contractor's operation.

3.10 REPLACEMENT OF EXISTING MAILBOXES, CULVERTS, CLOTHESLINE POSTS, FENCES AND OTHER SUCH FACILITIES

A. Existing mailboxes, drainage culverts, clothesline posts, fences and the like shall not be damaged or disturbed unless necessary, in which case, they shall be replaced in as good condition as found as quickly as possible. Existing materials shall be reused in replacing such facilities when materials have not been damaged by the Contractor's operations. Existing facilities damaged by Contractor's operation shall be replaced with new materials of the same type at the Contractor's expense. Work in this category is not a pay item.

B. Replacement of paved drainage ditches within highway right-of-way shall be accomplished in accordance with Department of Transportation specifications.

3.11 PORTLAND CEMENT CONCRETE DRIVEWAY REPLACEMENT

A. Wherever Portland cement concrete driveways are removed, they shall be reconstructed to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than existed prior to the operation.

B. The existing concrete paving shall be sawed or cut to straight edges 12 inches outside the edges of the trench or broken out to an existing joint, as directed by the Engineer. The concrete pavement shall be equal to the existing pavement thickness but not less than 6 inches in thickness for driveways.

C. Pavement shall be reinforced with 6 x 6 #10-10 wire mesh and shall be constructed with 3000 psi concrete.

3.12 RIP-RAP STREAM BANK SLOPE PROTECTION

A. The Contractor shall install rip-rap stream bank slope protection at locations directed by the Engineer. Rip-rap slope protection shall be 12-inches thick and shall meet State D.O.T. Standard Specifications.

3.13 TESTING

A. All pressure piping (lines not laid to grade) shall be given a hydrostatic test of at least 1.5 times the normal operating pressure of the pipe (at its lowest elevation), but not to exceed the rated working pressure of the pipe or valves. Note: Engineer shall verify test pressure. Loss of pressure during the test shall not exceed 0 psi in a 4-hour period and 5 psi in a 24-hour period. Any test results that do not meet either of these requirements shall constitute a failure of the pressure test.

B. No water leakage in pipelines, when tested under the hydrostatic test described above, shall be allowed.

C. Contractor shall furnish a recording gauge and recording pressure charts during duration of test. Recording pressure charts shall be turned over to the Engineer at conclusion of tests. The pressure recording device shall be suitable for outside service, with a range from 0-200 psig, 24-hour clock, and shall be approved by the Engineer.

D. Pipelines shall be tested before backfilling at joints except where otherwise required by necessity or convenience.

E. Duration of test shall be not less than four (4) hours where joints are exposed and not less than 24 hours where joints are covered.

F. Where leaks are visible at exposed joints, evident on the surface where joints are covered, and/or identified by isolating a section of pipe, the joints shall be repaired and leakage must be minimized, regardless of total leakage as shown by test.

G. All pipe, fittings, valves, and other materials found to be defective under test shall be removed and replaced at no additional expense to the Owner.

H. Lines which fail to meet tests shall be repaired and retested as necessary until test requirements are complied with.

I. Where nonmetallic joint compounds are used, pipelines should be held under normal operating pressure for at least three days before testing.

J. The Owner will provide initial water for testing the pressure piping. Should the first test fail to pass, all additional water required for subsequent tests shall be furnished at the Contractor's expense.

K. The cost of testing of pressure piping is incidental and is to be included in the Contractor’s unit Contract Price.

3.14 CLEAN UP

A. Upon completion of installation of the piping and appurtenances, the Contractor shall remove all debris and surplus construction materials resulting from the Work. The Contractor shall grade the ground along each side of pipe trenches in a uniform and neat manner leaving the construction area in a shape as near as possible to the original ground line.

3.15 ALTERNATE METHOD OF INSTALLATION

A. In lieu of traditional trenching methods for pipe installation, with the approval of the Engineer, the Contractor may choose to install the pipe utilizing the trenchless technology of horizontal directional drilling (HDD). Horizontal directional drilling shall be as specified in Section 330524.

END OF SECTION 333413

APPENDIX A

La GRANGE UTILITIES COMMISSION WATER SPECIFICATIONS AND STANDARD DRAWINGS

Water Specifications Standard Drawings

La Grange Utilities Commission

412 E. Jefferson Street
La Grange Kentucky 40031
502-222-9325

Scot Treece
Director

Updated 1-10-22

Water Specifications Standard Drawings

La Grange Utilities Commission

REVISED 3-5-2004

INDEX

STANDARD DRAWINGS

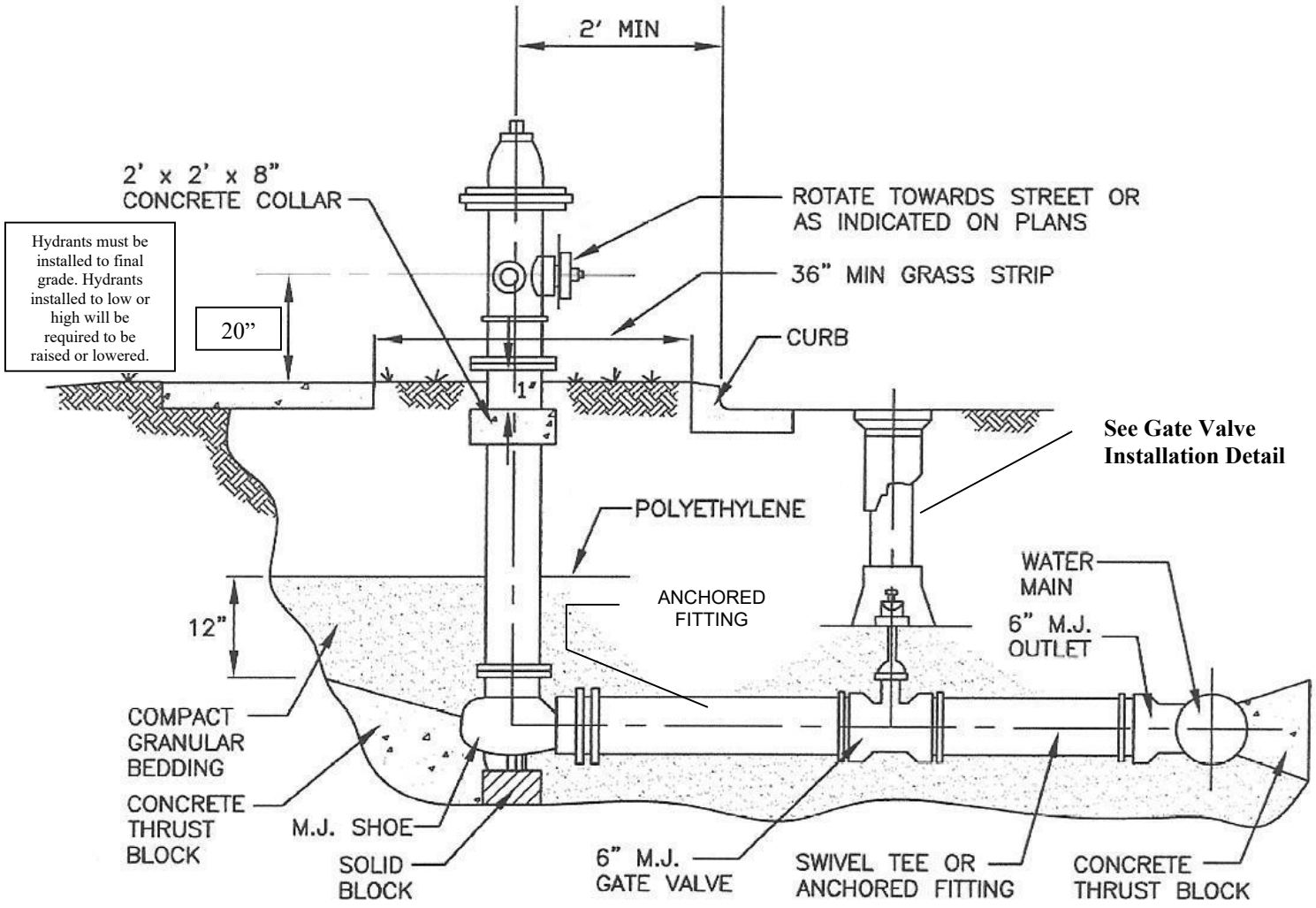
LA GRANGE UTILITIES COMMISSION

412 E. Jefferson Street

LA GRANGE, KY. 40031

Date 3-5-04

NOTE:
FH TO BE A MIN. 5'
FROM ALL ENTRANCES



Fire Hydrant Installation
Drawing Not To Scale

STANDARD DRAWINGS

LA GRANGE UTILITIES COMMISSION

412 E. Jefferson Street

LA GRANGE, KY. 40031

Date 3-5-04

GENERAL FIRE HYDRANT NOTES

1. Install Hydrant plumb and clear of all objects that would interfere with intended use.

2. #57 gravel is to be brought above weep hole and covered with plastic. Six cubic foot seepage well filled with clean #3 crushed stone shall be installed below hydrant.

3. Maximum friction loss shall not be more than 205 psi at a flow rate of 600 gpm with a total loss of not more than 5 psi between the street main and outlet.

4. Fire Hydrants shall be approved AWWA compression model with 5-1/2" hydrant valve, two 4 ½" double pumper nozzles, national standard threads, national standard pentagon operating nut, opening left (CCW).

5. Acceptable Traffic Breakaway Fire Hydrant Models Are:
   a. Mueller Centurian
   b. U.S. Pipe

6. After installation repaint fire hydrant with two coats yellow enamel. Paint nozzle caps and top bonnet with color specified by Fire Department.

7. Install gate valve between fire hydrant and water main.

8. The tee located at the water main shall be installed with concrete thrust blocking in accordance with La Grange Utilities Commission specifications.

9. All pipes from tee to hydrant shall be Class 350 ductile iron. A 13" Hydrant Spool Adapter (or longer) or ¾" dia. all-thread stainless-steel rod shall be used to secure hydrant to water main.

10. Drainage holes shall be clear of concrete

Fire Hydrant Specification (5¼" Main Valve)

Fire hydrants purchased or installed shall meet or exceed all applicable requirements and tests of ANSI and the latest revisions of AWWA Standard C502. Fire hydrants shall meet all test requirements and be listed by Underwriters Laboratories Inc. Fire hydrants shall meet all test requirements and have full approval of Factory Mutual. Fire hydrants shall meet the following requirements:

1. Fire hydrants shall be rated for a working pressure of 250 Psi. (1725 kPa).

2. Fire hydrants shall be of the compression type, opening against the pressure and closing with the pressure.

3. Fire hydrants shall have a minimum 5¼" main valve opening and a minimum inside lower/upper barrel diameter (I.D.) of 7" to assure maximum flow performance. Pressure loss at 1,000 GPM shall not exceed the value of 4.5" Pumper Nozzle: 2.50 psi.

4. Fire hydrants shall be two-way in design, having two 4.5" pumper nozzles. Nozzle thread type shall be NST. Nozzles shall thread counterclockwise into hydrant barrel utilizing "O" ring seals. A suitable nozzle lock shall be in place to prevent inadvertent nozzle removal.

5. The bonnet assembly shall provide an oil reservoir and lubrication system that automatically circulates lubricant to all stem threads and bearing surfaces each time the hydrant is operated. This lubrication system shall be sealed from the waterway and any external contaminants by use of "O" ring seals. An anti-friction washer shall be in place above the thrust collar to further minimize operating torque. The oil reservoir shall be factory filled with a low viscosity; FDA approved non-toxic oil lubricant which will remain fluid through a temperature range of –60° F to +150°F.

6. The operating nut shall be a one-piece design, manufactured of ASTM B-584 bronze. It shall be pentagon/square in shape and the nut dimensions shall be as specified by the Director. The operating nut shall be affixed to the bonnet by means of an ASTM B-584 bronze hold down nut. The hold down nut shall be threaded into the bonnet in such a manner as to prevent accidental disengagement during the opening cycle of the hydrant. The use of Allen head set screws as a means of retention is unacceptable. A resilient weather seal shall be incorporated into the hold down nut, for the purpose of protecting the operating mechanism from the elements.

7. The direction of the opening shall be as specified by the Director. An arrow shall be cast on the bonnet flange to indicate the specified opening direction.

8. The hydrant bonnet shall be attached to the upper barrel by not less than eight bolts and nuts and sealed by an "O" ring.

9. Hydrants shall be a "traffic-model" having upper and lower barrels joined at the ground line by a separate and breakable "swivel" flange providing 360 degree of rotation of upper barrel for proper nozzle facing. This flange shall employ not less than eight bolts. The safety flange segments shall be located under the upper barrel flange to prevent the segments from falling into the lower barrel when the hydrant is struck. The pressure seal between the barrels shall be an "O" ring. The proper ground line shall be cast clearly on the lower barrel and shall provide not less than 18" of clearance of the lowest nozzle to the ground.

10. The operating stem shall consist of two pieces, not less than 1¼" diameter (excluding threaded or machined areas) and shall be connected by a stainless-steel safety coupling. The safety coupling shall have an integral internal stop to prevent the coupling from sliding down into the lower barrel when the hydrant is struck. Screws, pins, bolts or fasteners used in conjunction with the stem coupling shall also be stainless steel. The top of the lower stem shall be recessed 2" below the face of the safety flange to prevent water hammer in the event of a "drive over" where a vehicle tire might accidentally depress the main valve.

11. The lower barrel shall be an integrally cast unit. The use of threaded on or mechanically attached flanges is deemed unacceptable. The hydrant bury depth shall be clearly marked on the hydrant lower barrel.

12. Composition of the main valve shall be a molded rubber having a durometer hardness of 95 +/- 5 and shall be reversible in design to provide a spare in place. Plastic (polyurethane) main valves are unacceptable. The main valve shall have a cross section not less than 1".

13. Hydrants shall be equipped with two (2) drain valves which drain the barrel when the hydrant is closed and seal shut when the hydrant is opened. These drain valves shall be an integral part of the one-piece bronze upper valve plate. They shall operate without the use of springs, toggles, tubes, levers or other intricate synchronizing mechanisms.

14. The upper valve plate, seat ring and drain ring (shoe bushing) must be ASTM B-584 bronze and work in conjunction to form an all bronze drain way. A minimum of two (2) internal and two (2) external drain openings are required. Drains ported through an iron shoe must be bronze lined.

15. The bronze seat ring shall thread into a bronze drain ring (or shoe bushing) providing a bronze to bronze connection. Seat rings shall be "O" ring pressure sealed.

16. The shoe inlet size and connection type shall be as specified (flanged, MJ, etc.), having ample blocking pads for sturdy setting and the MJ connection must have two strapping lugs to secure the hydrant to piping. A minimum of six bolts and nuts is required to fasted the shoe to the lower barrel.

17. The interior of the shoe including the lower valve plate and stem cap nut shall have a protective coating that meets the requirements of AWWA C-550. If a stem cap nut is utilized, it must be locked in place by a stainless-steel lock washer or similar non-corrosive device that will prevent the cap nut from backing-off during normal use.

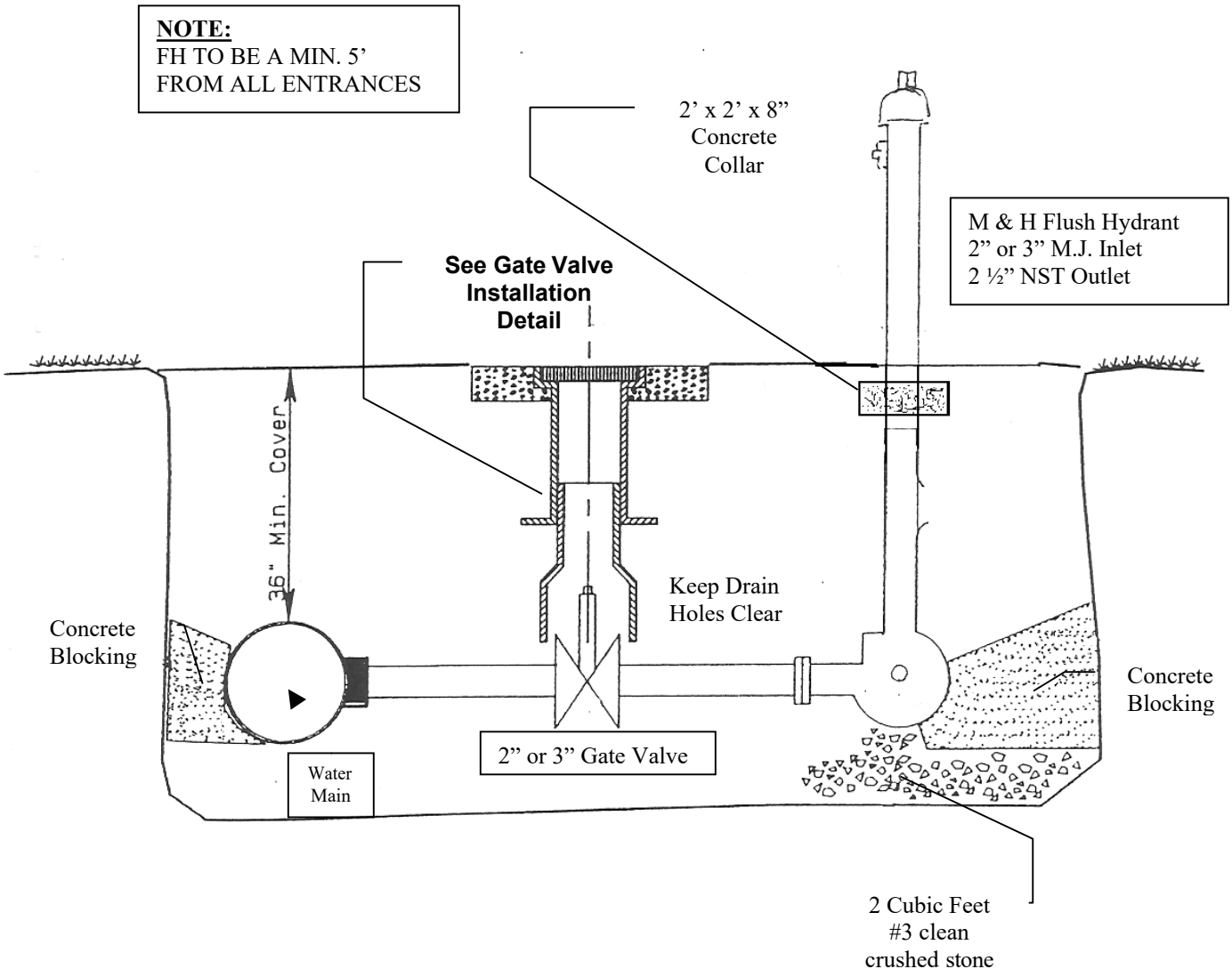
18. Hydrants shall be warranted by the manufacturer against defects in materials or workmanship for a period of ten (10) years from the date of manufacture. The manufacturing facility for the hydrant must have current ISO certification.

19. Hydrants shall be Mueller Super Centurion 250 or approved equal.

Failure to comply with any of these above requirements is sufficient cause for rejection of proposed hydrants.

LA GRANGE UTILITIES COMMISSION reserves the right to accept only those materials that are in full compliance with these specifications and deemed most advantageous to its interests.

Flush Hydrant Assembly



NOTES:

1. All Fittings to be grip ringed.
2. #57 Gravel above weep hole and covered in plastic. #3 crushed stone installed below hydrant.
3. Hydrants must be installed to final grade. Hydrants installed to low or high will be required to be raised or lowered.

STANDARD DRAWINGS

LA GRANGE UTILITIES COMMISSION

412 East Jefferson St.

LA GRANGE, KY. 40031

Date 3-5-04

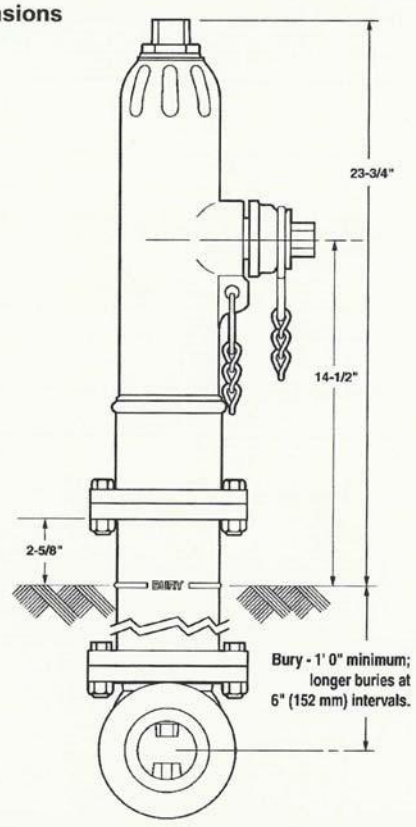
9.20 Mueller Co.

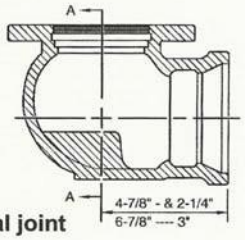
MUELLER® 2-1/8" POST TYPE FIRE HYDRANT

Rev. 4-99

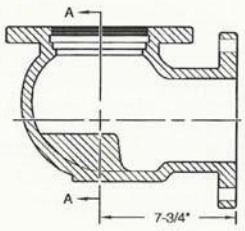
- Catalog numbers --
  A-411 2-1/8" main valve opening two way (two 1-1/2" hose nozzles)
  A-411 2-1/8" main valve opening one way (one 2-1/2" hose nozzle)
- Meets all applicable parts of ANSI/AWWA C502 Standard
- Post type dry barrel design
- Compression type main valve closes with pressure
- Operating nut available in wide variety of shapes and sizes
- Field replaceable hose nozzles
- Hose nozzles have large radius, full flow openings for low friction loss
- Contoured shoe is designed for full flow
- Dual bronze drain valves provide effective barrel drainage
- 150 psig (1034 kPa) maximum working pressure, 300psig (2068 kPa) test pressure

Dimensions

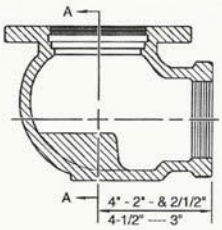




Mechanical joint



Flange



Threaded

STANDARD DRAWINGS

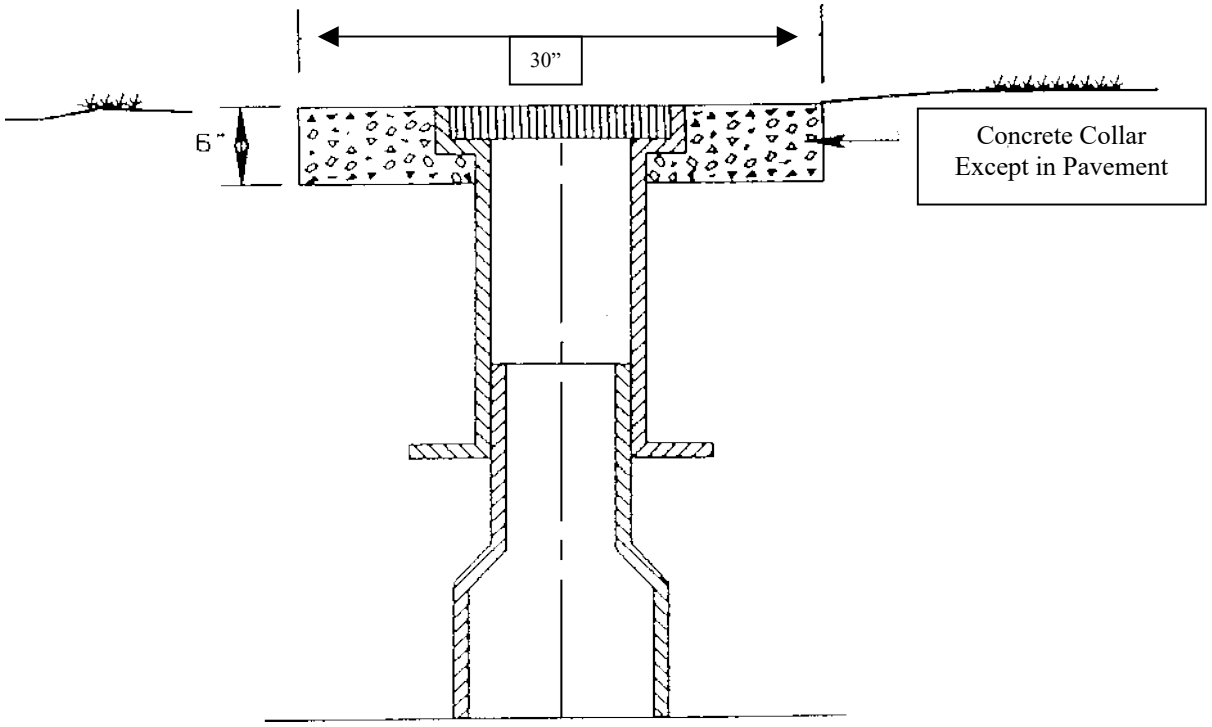
LA GRANGE UTILITIES COMMISSION
412 East Jefferson St.
LA GRANGE, KY. 40031

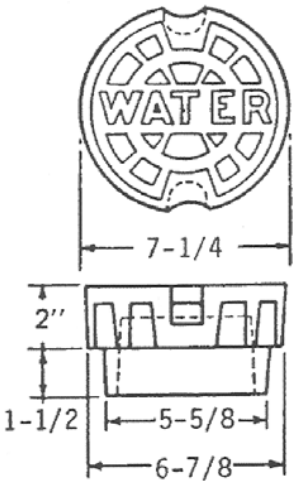
Date 3-5-04

Cast Iron Screw Type Valve Box With Cast Iron Cap

30" SQ. X 6" Thick Concrete Pad Surrounding Box, Min. 3,000 P.S.I. Poured In Place.

LUC approved round concrete collar on tamped gravel alternate





STANDARD DRAWINGS

LA GRANGE UTILITIES COMMISSION

412 East Jefferson St.

LA GRANGE, KY. 40031

Date 3-5-04

STANDARD DRAWINGS

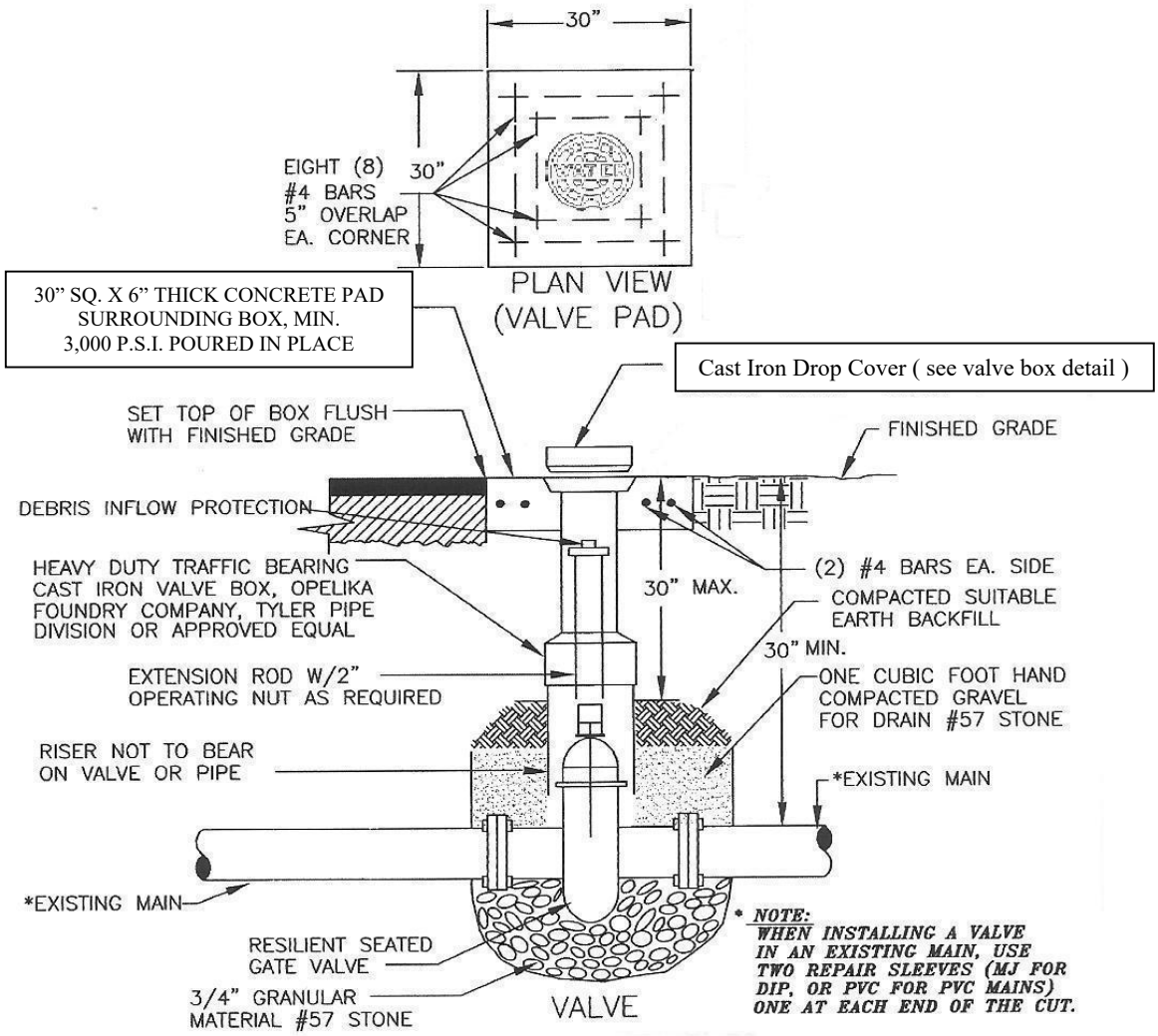
LA GRANGE UTILITIES COMMISSION

412 E. Jefferson Street

LA GRANGE, KY. 40031

Gate Valve Installation
Date 3-5-04

LUC Approved round concrete collar on tamped gravel alternate



NOTE:
CONCRETE WITH REBAR ANCHORS MAYBE REQUIRED INPLACE OF GRANULAR FILL.

La Grange Utilities Commission
3-12” Resilient Wedge Gate Valve
Specification Full Wall

1. The resilient seat gate valves shall fully comply with the latest revision of AWWA C509, and shall also be UL listed and FM approved. The valves shall be tested and certified to ANSI/NSF 61.

2. The valve shall have a 250 psi working pressure.

3. The valve type shall be NRS (non-rising stem) as specified.

4. The valve shall have an arrow cast on the operating nut or hand wheel showing opening direction. The direction of opening shall be as specified.

5. The NRS valves shall be provided with a 2” square operating nut The bolt that attaches the operating nut to the stem shall be recessed into the operating nut so as not to interfere with valve wrench operation.

6. The valves shall have bolts and nuts for the stuffing box and bonnet with one of the following compositions:
   a. Type 304 stainless steel.
   b. Type 316 stainless steel.

7. The valve stem shall be made of bronze ASTM B-132 alloy C67600 bar stock material. The stem shall have at least one “anti-friction” thrust washer above and below the stem collar to reduce operating torque. The design of the NRS valve stem shall be such that if excessive input torque is applied, stem failure shall occur above the stuffing box at such a point as to enable the operation of the valve with a pipe wrench or other readily available tool. The stem material shall provide a minimum 70,000psi tensile strength with 15% elongation and yield strength of 30,000psi. Valves with cast stems or two-piece stem collars are not acceptable.

8. The NRS valves shall have a stuffing box that is O-ring sealed. Two O-rings shall be placed above and one O-ring below the stem thrust collar. The thrust collar shall be factory lubricated. The thrust collar and its lubrication shall be isolated by the O-rings from the waterway and from outside contamination providing permanent lubrication for long term ease of operation. Valves without a stuffing box are unacceptable. Valves without at least three stem O-rings are also unacceptable.

9. The valve body, bonnet, stuffing box, and disc shall be composed of ASTM A-126 Class B grey iron or ASTM A395 or A536 ductile iron. The body and bonnet shall also adhere to the minimum wall thickness as set forth in Table 2, section 4.3.1 of AWWA C509. Wall thickness less than those in table 2 are not acceptable.

10. The valve disc and guide lugs must be fully (100%) encapsulated in SBR ASTM D2000 rubber material. The peel strength shall not be less than 75 pounds per inch. Guide caps of an acetal bearing material shall be placed over solid guide lugs to prevent abrasion and to reduce the operating torque.

11. The valves shall have all internal and external ferrous surfaces coated with a fusion bonded thermosetting powder epoxy coating of 10 mils nominal thickness. The coating shall conform to AWWA C550.

12. The tapping valves shall have an inlet flange conforming to ANSI B16.1 Class 125 for attachment to a tapping sleeve or cross. In addition, the valve inlet flange shall have a machined projection or raised face complying with MSS SP-60 for accurate alignment to the mating recess in the tapping sleeve flange. The seat opening of the tapping valves shall be at least .30” larger than the nominal pipe size to permit full diameter cuts.

13. The valves shall be warranted by the manufacturer against defects in materials or workmanship for a period of ten (10) years from the date of manufacture. The manufacturing facility for the valves must have current ISO certification.

The NRS valves shall be MUELLER→ A2360 series or approved equal.

The NRS tapping valves shall be MUELLER→ T2360 series or approved equal.

Note: Valves 2” and 2-1/2” are not covered under AWWA C-509.

La Grange Utilities Commission
3-12” Resilient Wedge Gate Valve
Specification Full Wall

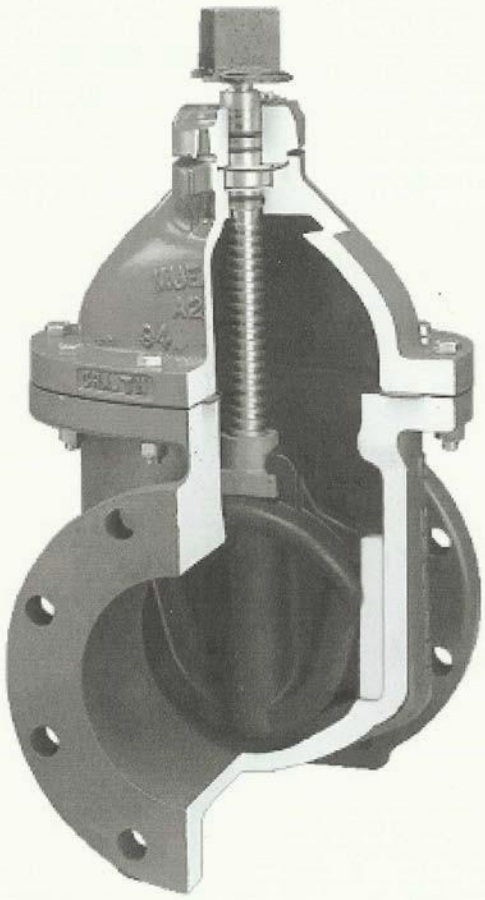
MUELLER® 2360 SERIES™ RESILIENT WEDGE GATE VALVE

Mueller Co. **10.1**

Rev. 12-01

MUELLER® 2-1/2"-12" Resilient Wedge Gate Valve

- ❑ TWO ANTI - FRICTION WASHERS — polymer washers (one above and one below the thrust collar) further reduce operating torque in both the opening and closing directions.
- ❑ TRIPLE O-RING SEALS — two above the thrust collar; one below. Uppermost serves as dirt seal. Retain lubrication on thrust collar and isolate it from waterway and outside contamination. Top two can be replaced with valve fully open and under pressure.
- ❑ 250 PSIG MAXIMUM WORKING PRESSURE— hydrostatically tested at 500 psig. Surpasses ANSI/AWWA C509 standards by 25% (UL/FM 200 psig working pressure, 400 psig hydrostatic pressure).
- ❑ STEM — machined from forged manganese bronze bar stock for strength where it is needed most, at the thrust collar.
- ❑ WEDGE — cast iron, fully encapsulated in molded rubber complying with ASTM D2000.
- ❑ MUELLER® PRO-GARD™ FUSION EPOXY COATING— of nominal 10 mils protects all interior and exterior exposed iron surfaces and complies fully with AWWA C550 and is certified to NSF 61.
- ❑ MANUFACTURED AND TESTED — in compliance with ANSI/AWWA C509 Standard and is certified to ANSI/NSF 61. Manufactured at facility with ISO 9001 certification and UL 262, FM 1120/1130.
- ❑ BI-DIRECTIONAL FLOW
- ❑ FLAT BOTTOM SURFACES — allow all 2360 series valves to stand upright for ease of handling and storage.



- ❑ EXTENDED WEDGE GUIDES— molded as part of the wedge, fit into guide channels in the valve body and maintain optimum wedge alignment with the stem throughout the wedge's travel, preventing the disc from tilting downstream during operation.
- ❑ GUIDE CAP BEARINGS — protective guide cap bearings made of a polymer bearing material snap over each rubber encapsulated guide on the wedge, providing a bearing interface between the wedge guides and the body's interior guide channels, protecting both from wear, even after thousands of cycles under severe pressure and flow conditions.
- ❑ SMOOTH, OVERSIZED FLOW WAY — all Mueller 2360 series RW Valves have a full, round, unobstructed flow way which accommodates full-sized shell cutters without interference and which provides superior flow characteristics.
- ❑ TEN YEAR LIMITED WARRANTY — (see separate Mueller Warranty document for terms).

NOTE: Stainless Steel Fasteners Are Required.

STANDARD DRAWINGS

LA GRANGE UTILITIES COMMISSION

412 East Jefferson St.

LA GRANGE, KY. 40031

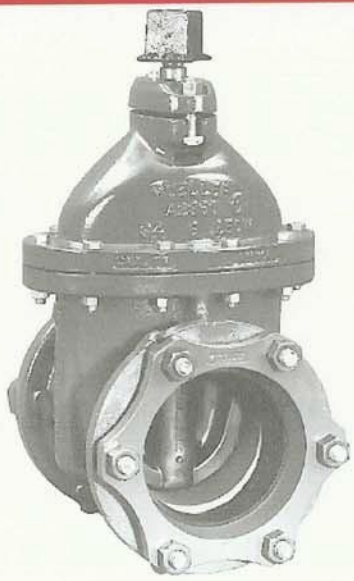
Date 3-5-04

10.8 Mueller Co.

2"-12" MUELLER® A-2360 RESILIENT WEDGE GATE VALVES - M.J. x M.J.

Rev. 12-01 Elec. 3-04 Shaded area indicates change.

- ❑ Catalog number–
  A-2360-20 Mechanical joint ends (with mechanical joint unassembled accessories)
  A-2360-23 Mechanical joint ends (less mechanical joint accessories)
  A-2360-25 Mechanical joint ends (with transition gaskets)
- ❑ Sizes—2", 3", 4", 6", 8", 10", 12"
- ❑ Meets or exceeds all applicable requirements of ANSI/AWWA C509 Standard and is certified to ANSI/NSF 61
- ❑ Standard mechanical joint ends comply with ANSI/AWWA C111
- ❑ Iron body with nominal 10 mils MUELLER® Pro-Gard™ Fusion Epoxy Coated interior and exterior surfaces
- ❑ Epoxy coating meets or exceeds all applicable requirements of ANSI/AWWA C550 Standard and is certified to ANSI/NSF 61
- ❑ Iron wedge, symmetrical & fully encapsulated with molded rubber; no exposed iron
- ❑ Non-rising stem (NRS)
- ❑ Triple O-ring seal stuffing box (2 upper & 1 lower O-rings)
- ❑ 2" square wrench nut (optional handwheel available)—open left or open right
- ❑ 2"-12" sizes—250 psig (1723 kPa) maximum working pressure, 500 psig (3447 kPa) static test pressure
- ❑ UL Listed, FM Approved: 200 psig (1379 kPa) – 3"-12" sizes



A-2360-20
M.J. accessories shipped unassembled

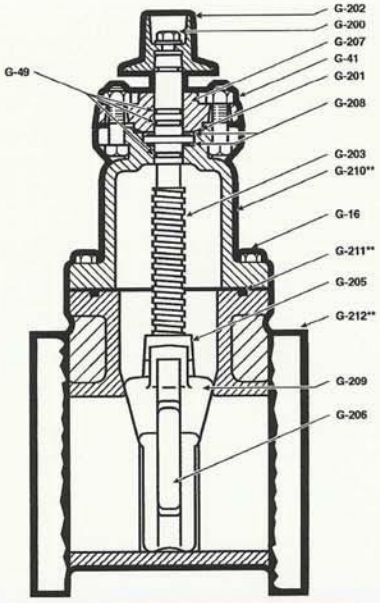
Options

See pages 10.34 and 10.35 for more information on Resilient Wedge Gate Valve options

- ❑ Position indicators
- ❑ ASTM B98-C66100/H02 stem
- ❑ Stainless steel fasteners: Type 304, Type 316
- ❑ Handwheel

Resilient wedge gate valve parts

Catalog Part No.	Description	Material	Material standard
G-16	Bonnet Bolts & Nuts	Carbon Steel	ASTM A307 Grade B, Zinc Plated
G-41	Stuffing Box Bolts & Nuts	Carbon Steel	ASTM A307 Grade B, Zinc Plated
G-49	Stem O -rings (3)	Rubber	ASTM D2000
G-200	Wrench Nut Cap Screw	Carbon Steel	ASTM A307 Grade B, Zinc Plated
G-201	Stuffing Box Seal	Rubber	ASTM D2000
G-202	Wrench Nut	Cast Iron	ASTM A126 CL.B
G-203	Stem	Bronze	ASTM B138
G-204	Hand Wheel (not shown)	Cast Iron	ASTM A126 CL.B
G-205	Stem Nut	Bronze	ASTM B62
G-206	Guide Cap Bearings	Celcon	
G-207	Stuffing Box	Cast iron	ASTM A126 CL.B
G-208	Anti-friction Washers (2)	Celcon	
G-209	Wedge, Rubber Encapsulated	Cast Iron*	ASTM A126 CL.B
G-210**	Bonnet	Cast Iron	ASTM A126 CL.B
G-211**	Bonnet O-ring	Rubber	ASTM D2000
G-212**	Body	Cast Iron	ASTM A126 CL.B



* Fully encapsulated in molded rubber with no iron exposed

** Previous to 1999 these parts on 4"-12" valves were designed with a gasket instead of an O-ring and with additional bolt holes (2"-3" sizes retain gasket design affecting these parts). Confirm the type of seal when ordering a replacement gasket or O-ring.

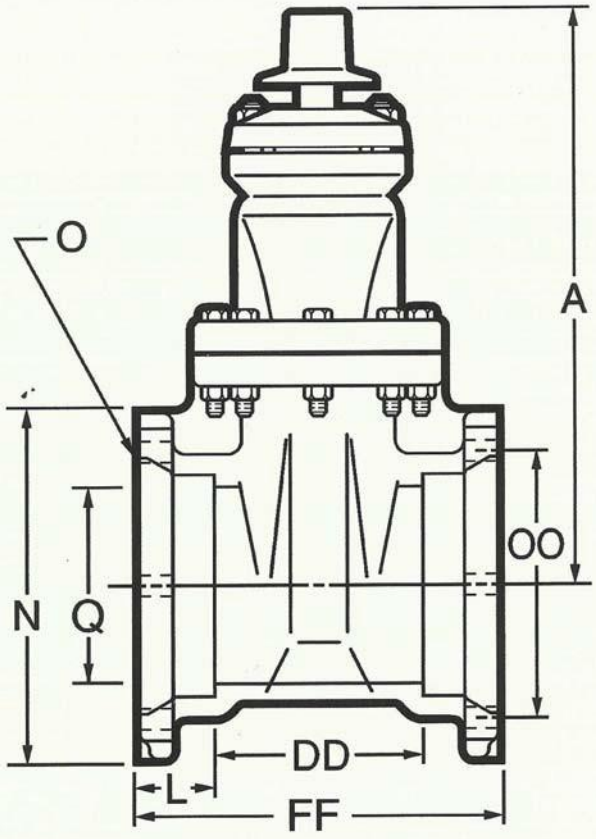
NOTE: Stainless Steel Fasteners are required.

2"-12" MUELLER® A-2360 RESILIENT WEDGE GATE VALVE - M.J. x M.J.

Mueller Co.

10.9

Rev. 12-01



Dimensions

Dimension*	Nominal size						
	2"	3"	4"	6"	8"	10"	12"
A	9.88	12.38	14.19	18.00	21.50	25.50	28.62
FF	8.50	9.00	10.00	11.50	12.50	14.75	14.88
L	2.50	2.50	2.50	2.50	2.50	2.50	2.50
N	4.62	7.50	9.12	11.12	13.37	15.62	17.88
O (number and size of holes)	4–7/8	4–7/8	4–7/8	6–7/8	6–7/8	8–7/8	8–7/8
DD	3.50	4.00	5.00	6.50	7.50	9.75	9.88
Q (bore)	2.30	3.30	4.30	6.30	8.30	10.30	12.30
OO (bolt circle diameter)	5.00	6.19	7.50	9.50	11.75	14.00	16.25
Turns to open	8	11	14	20.5	26.5	33	38.5
Weight*	40	83	120	186	280	405	540

* All dimensions are in inches. All weights include accessories are in pounds and are approximate.

NOTE: Stainless Steel Fasteners are Required.

STANDARD DRAWINGS

LA GRANGE UTILITIES COMMISSION

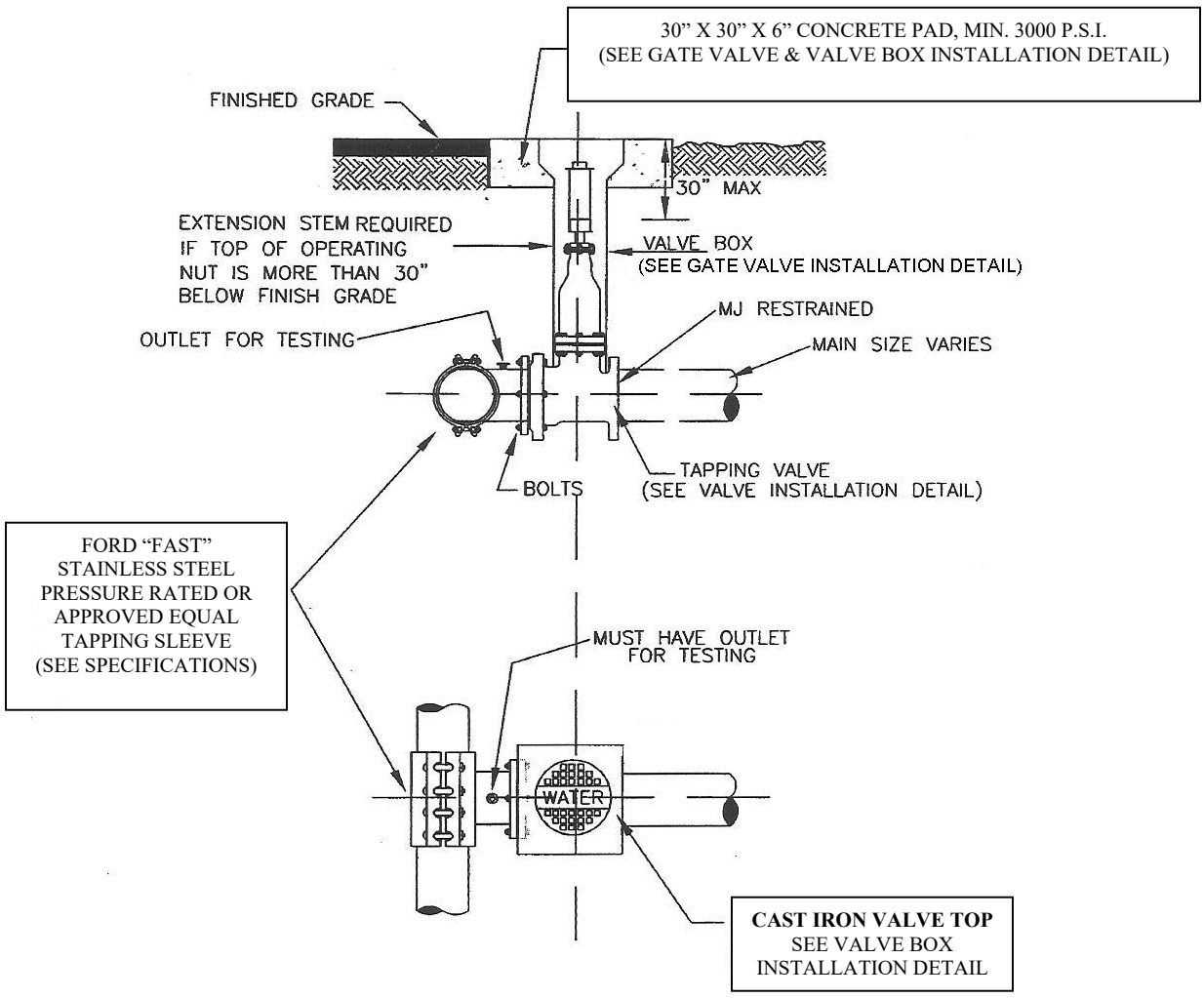
412 East Jefferson St.

LA GRANGE, KY. 40031

Date 3-5-04

Tapping Sleeve & Valve Detail

LUC approve Round concrete collar on tamped gravel alternative



STANDARD DRAWINGS

LA GRANGE UTILITIES COMMISSION

412 East Jefferson St.

LA GRANGE, KY. 40031

Date 3-5-04

STANDARD DRAWINGS

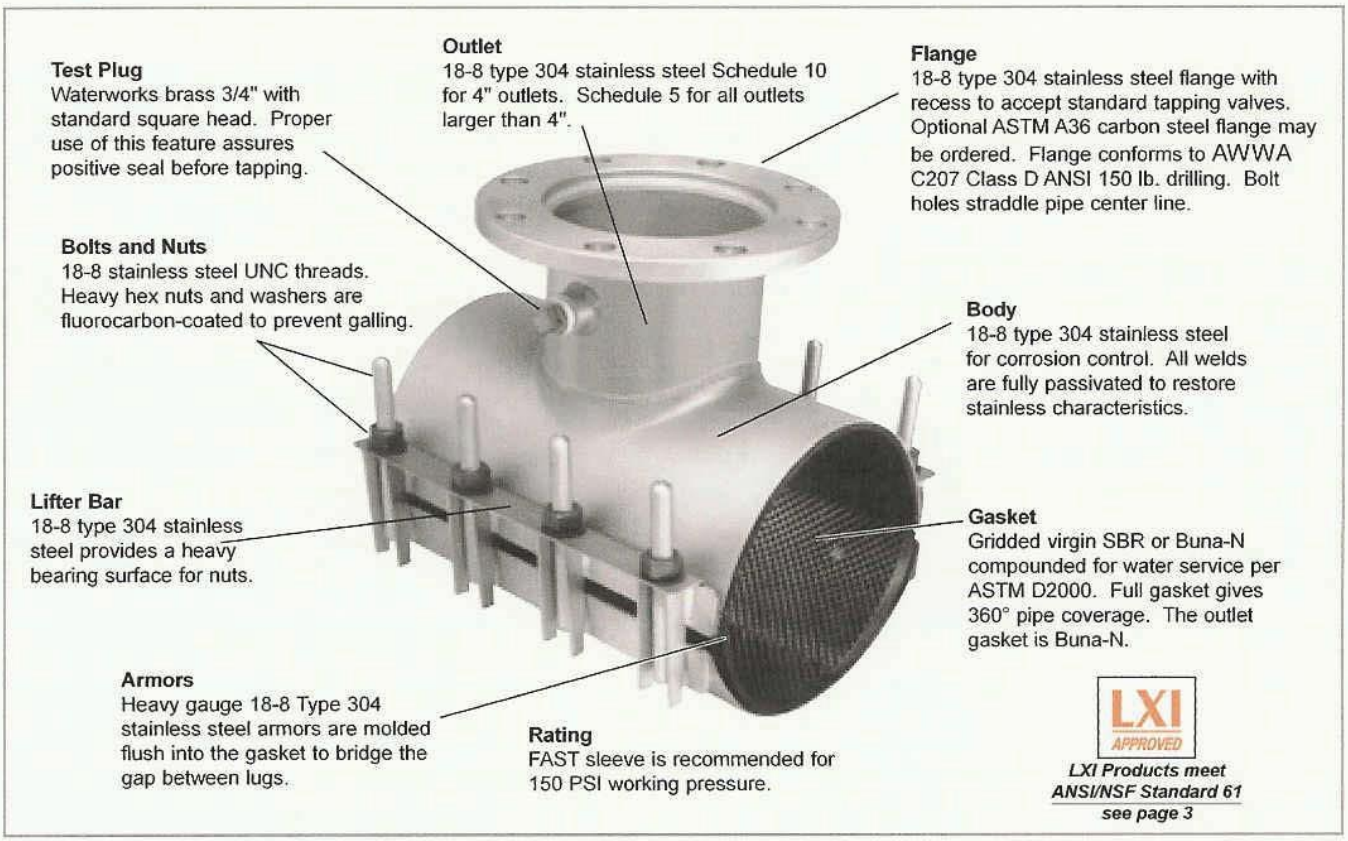
LA GRANGE UTILITIES COMMISSION
412 East Jefferson St
LA GRANGE, KY.
40031 Date 3/05/04

Specifications

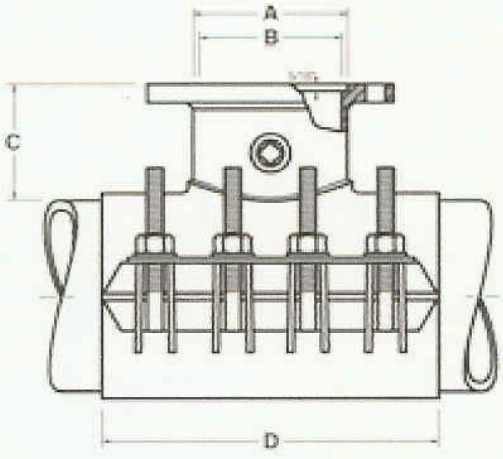
Ford Tapping Sleeves Style FAST

Ford FAST Tapping Sleeves take the guesswork out of large pipe taps. A gridded gasket surrounds the pipe and not only cushions the pipe during the tap but also helps prevent pipe breaks. The flange outlet is double welded inside and out.

The sleeve is constructed of Grade 18-8 type 304 stainless steel to provide corrosion protection and is easy to handle. Sleeves are available in pipe sizes 4" through 24", with flange outlets from 4" through 12". Detailed specifications and critical dimensions are outlined below.



FAST Dimensions



Nom. Pipe Size	Flange Size	A	B	C	D	Stud Size	No. of Studs	Design Style
4" through 12"	4"	5-1/32"	4-1/4"	5-3/16"	15"	5/8"	8	2 pc.
	6"	7-1/32"	6-3/8"	5-1/2"	15"	5/8"	8	2 pc.
	8"	9-1/32"	8-5/16"	5-5/8"	20"	5/8"	12	2 pc.
	10"	11-1/32"	10-1/4"	6-1/8"	20"	3/4"	12	2 pc.
	12"	13-1/32"	12-1/4"	6-1/4"	24"	3/4"	14	2 pc.
14"	4"	5-1/32"	4-1/4"	5-3/16"	16"	3/4"	10	2 pc.
	6"	7-1/32"	6-3/8"	5-1/2"	16"	3/4"	10	2 pc.
	8"	9-1/32"	8-5/16"	5-5/8"	20"	3/4"	12	2 pc.
	10"	11-1/32"	10-1/4"	6-1/8"	20"	3/4"	12	2 pc.
	12"	13-1/32"	12-1/4"	6-1/4"	24"	3/4"	14	2 pc.
16" - 18"	4"	5-1/32"	4-1/4"	5-3/16"	16"	5/8"	15	3 pc.
	6"	7-1/32"	6-3/8"	5-1/2"	16"	5/8"	15	3 pc.
	8"	9-1/32"	8-5/16"	5-5/8"	20"	5/8"	18	3 pc.
	10"	11-1/32"	10-1/4"	6-1/8"	20"	3/4"	18	3 pc.
	12"	13-1/32"	12-1/4"	6-1/4"	24"	3/4"	21	3 pc.
20" - 24"	4"	5-1/32"	4-1/4"	5-3/16"	16"	3/4"	15	3 pc.
	6"	7-1/32"	6-3/8"	5-1/2"	16"	3/4"	15	3 pc.
	8"	9-1/32"	8-5/16"	5-5/8"	20"	3/4"	18	3 pc.
	10"	11-1/32"	10-1/4"	6-1/8"	20"	3/4"	18	3 pc.
	12"	13-1/32"	12-1/4"	6-1/4"	24"	3/4"	21	3 pc.

AA-4

SUBMITTAL INFORMATION

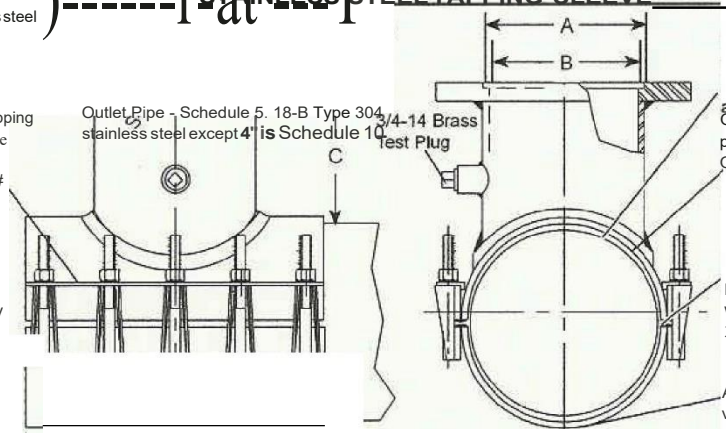
Stainless Steel Tapping Sleeve - *(FAST-xxx-x style)*

STAINLESS STEEL TAPPING SLEEVE

Flange - 16-6 Type 3(14 stainless steel with recess to accept standard tapping valve. Optional carbon ste"I flange available. Flange conforms to A\I'NJA C207 Class D ANSI 150# drill1i1g.

Lifter bar 18-8 Type 304 stainless steel provides a heavy bearing swface for nuts.

Studs, nuts. & washers - 18-B Type 304 stainless steel. Nuts and washers are fluorocar- ban ,;:oated to prevent galling.



Outlet Gasket - Gridded Virgin Buna-N compounded for water service, per ASTM 02000 . Outlet gasket assures complete seal of outlet area.

Full Gasket - Gridded Virgin SBR compounded for water service, per ASTM D2000. Full gasket gives 360° pipe coverage.

Armors - Heavy gage 16-8 Type 304 stainless steel are vulcanized to gasket to bridge the gap between lug, s

Body & Strap - 1B-B Type 304 stainless steel all welds are fully passivated to restore stainless characteristics.

NoM. PIPE SIZE	SLEEVE O.D. RANGE	BY	FLANGE SIZE	APPROX. WT.	NOMINAL DIMENSIONS - INCHES A	B	C	D	SADDLE THICKNESS (GAGE)	STRAP THICKNESS (GAGE)	Snm S121;	No. STUDS	CATALOG NUMBER*	SUBMITTED ITEM(s)
4"	4.50-4.80 4 .80-5.10 5.05-5.30		4	36	5-1/32	4-1/4	5-3/16	15	.075" (14)		5/8"	8	FAST-480- FAST-510- FAST-530-	
6"	6.60-7.00 6.90-7.30 7.10-7,50	X	4 6	39 43	5-1/32 7-1/32	4-1/4 6-3/8	5-3116 5-1/2	15		048" (18)	518"	8	FAST-700- FAST-730- FAST-750-	
8"	8.63-9.05 9.05-9.45 9.30-9.70		4 6 8	43 47 64	5-1/32 7-1132 9-1/32	4-1/4 6-3/8 8-15/16	5-3/16 5-1/2 5-5/8	15 15 20			518"	8 8 12	FAST-905 - FAST-945- FAST-970 -	
10' '	10.75-11.15 11.05-11.45 11.75-12.15	X	4 6 8 10	46 50 68 73	5-1/32 7-1132 9-1/32 11-1132	4-1/4 6-3/8 8-5116 10-1/4	5-3/16 5-112 5-5/8 6-118	15 15 20 20	.105" (12)	.063 (16)	518"	8 8 12 12	FAST-1115 - FAST 0 1145 - FAST-1215 -	
12"	12.75-13.20 1,3 10-13.50 14.00-14.40	X	4 6 8 10 12	49 53 72 77 107	5-1132 7-1/32 9"1/32 11-1132 13-1/32	4-1/4 6-3/8 8-5/15 10-1/4 12-1/4	5-3/16 5-1/2 .5-5/8 6-1/8 6-1/4	15 15 20 20 24		.048 (18 .048 (18 .048 (18 .063 (16 .063 (16	314" 5/8" 518" 5/8" 3/4" 3/4"	12 8 8 12 12 14	FAST-1320- FAST-1350 - FAST-1440 -	
14"	15.30-15.70 15.80-16.20 16.48-16.88		4 6 8 10 12	70 74 93 98 132	5-1132 7-1132 9-1/32 11-1/32 13-1/32	4-1/4 6-3/8 8-5/16 10-114 12-1/4	5-3/16 5-1/2 5-5/8 6-1/8 6-1/4	15 15 20 20 24		.048 (181 .048 (18) .048 (18) .063 (16 .063 (16)	3/4"	8 12 12 14	FAS1570 - FAST-1620 - FAST-1688 -	

""To order. Add flanged outlet size to catalog number. Example: The complete FAST catalog number for an 8" pipe (9-0 50 . 0 .) with a 6" stainless steel flange is FAST-945-6. For a carbon steel flange, add "A" to the catalog number: Example: FAST-945-6A

FEATURES

- Body, straps and UNC threaded studs are made of 18-8 Type 304 stainless steel. Flange can be either 18-8 Type 304 stainless steel or ASTM A36 carbon steel.
- All welds are fully passivated for corrosion resistance.
- Gasket is tapered Buna-N rubber (ASTM 02000) with diagonal grid.

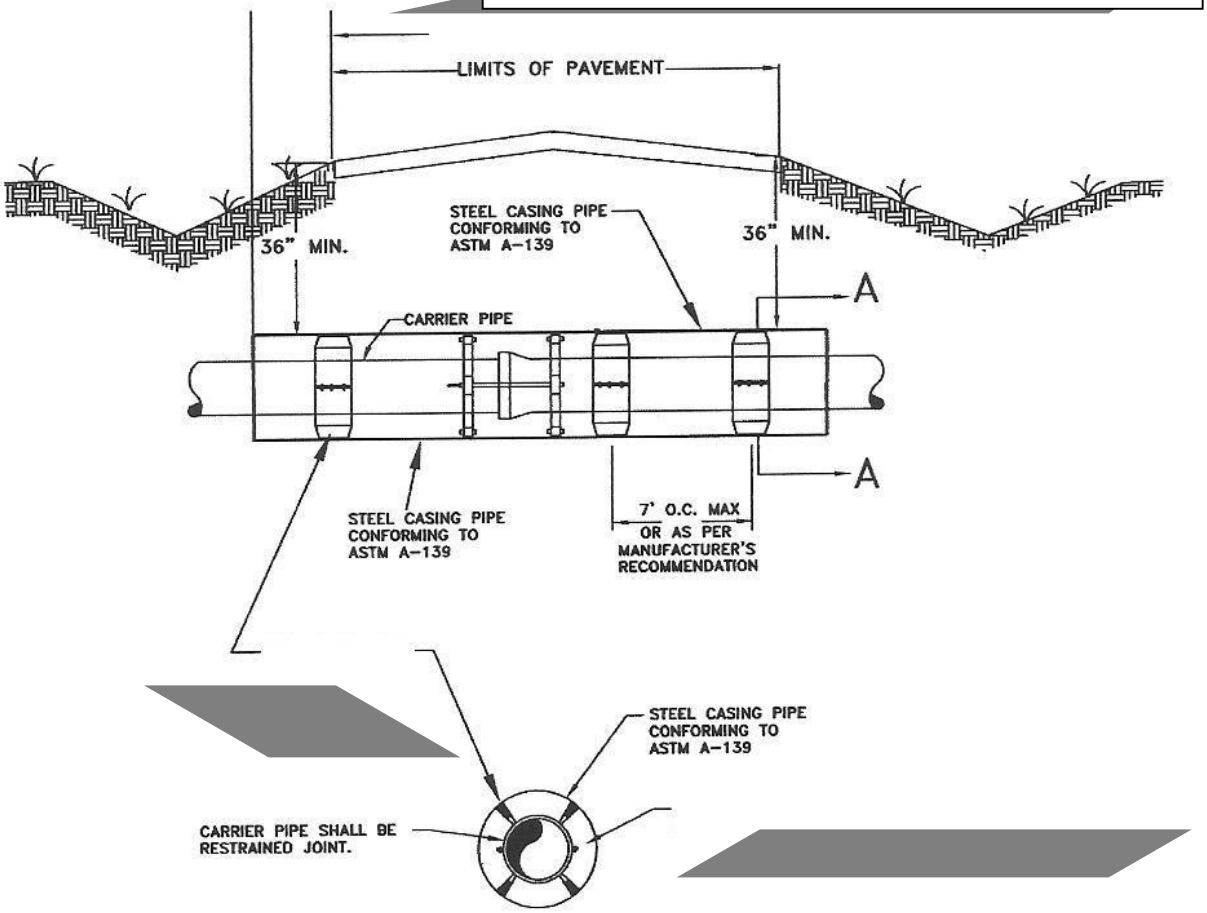
The Ford Meter Box Company considers the information in this submittal form to be correct at the time of publication. Item and option availability, including specifications, are subject to change without notice. Please verify that your product information is current.

The Ford Meter Box Company, Inc.
P.O. Box 443, Wabash, Indiana U SA 46992-0443
Phone: 260-563--3171 / Fax. 800-826-3487
Overseas Fax: 260-563-0167
http://www.fordmeterbox.com

Submitted By:

Casing & Boring Detail

EXTEND CASING BEYOND EDGE OF PAVEMENT AND / OR CURB. CASING MUST BE INSTALLED IN ACCORDANCE WITH LA GRANGE PUBLIC WORKS AND / OR KY DEPARTMENT OF TRANSPORATION REQUIREMENTS.



SECTION "A-A"

STANDARD DRAWINGS

LA GRANGE UTILITIES COMMISSION

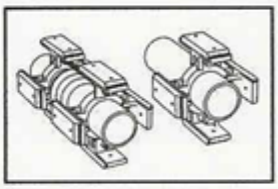
412 E. Jefferson Street

LA GRANGE, KY. 40031

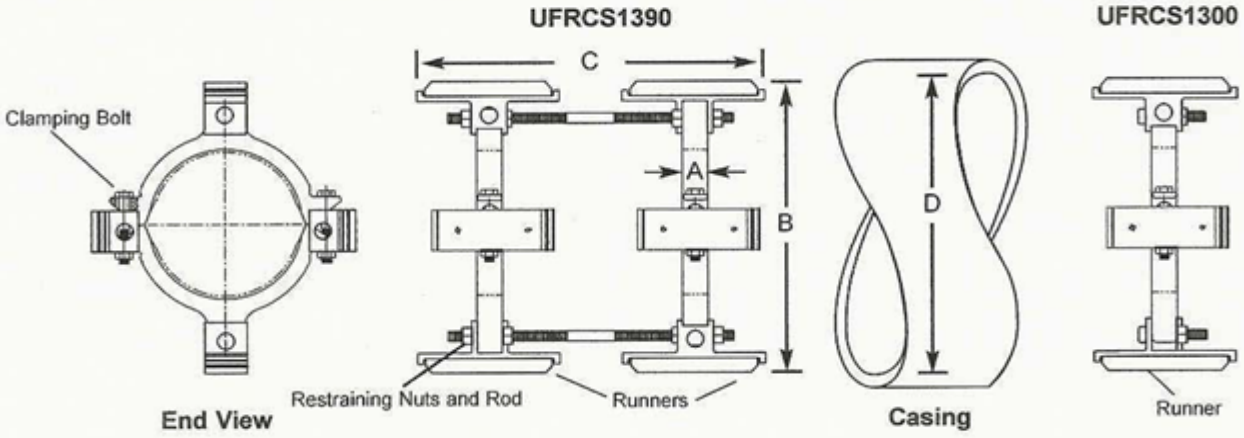
Date 3-5-04

SUBMITTAL INFORMATION

Uni-Flange Series Casing Spacers 4" - 8"UFRCS



CASING SPACERS FOR SUPPORT OF 4", 6" AND 8" PIPE BARREL AND PIPE BELL JOINT



RESTRAINED CASING SPACER FOR PIPE BELL JOINT - UFRCS1390

Nom. Pipe Size	Actual Pipe O.D.	Catalog Number	Approx. Shipping Weight	A	B (Approx.)	C (Approx.)	D Min. Casing Size (ID)	Runner Qty.	√ Submitted Items
4"	4.80"	UFRCS1390-C-4	31.7	1-1/8"	11-3/4"	12"	12.4"	8	
6"	6.90"	UFRCS1390-C-6	33.7	1-1/8"	13-3/8"	13"	13.6"	8	
8"	9.05"	UFRCS1390-C-8	44.9	1-1/8"	17-1/8"	15"	17.5"	8	

CASING SPACER FOR SUPPORT OF PIPE BARREL - UFRCS1300

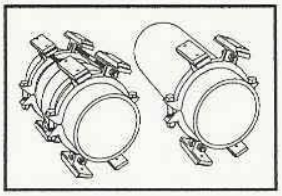
Nom. Pipe Size	Actual Pipe O.D.	Catalog Number	Approx. Shipping Weight	A	B (Approx.)	C (Approx.)	D Min. Casing Size (ID)	Runner Qty.	√ Submitted Items
4"	4.80"	UFRCS1300-C-4	14.2	1-1/8"	11-3/4"	N/A	12.4"	4	
6"	6.90"	UFRCS1300-C-6	15.2	1-1/8"	13-3/8"	N/A	13.6"	4	
8"	9.05"	UFRCS1300-C-8	21.4	1-1/8"	17-1/8"	N/A	17.5"	4	

FEATURES

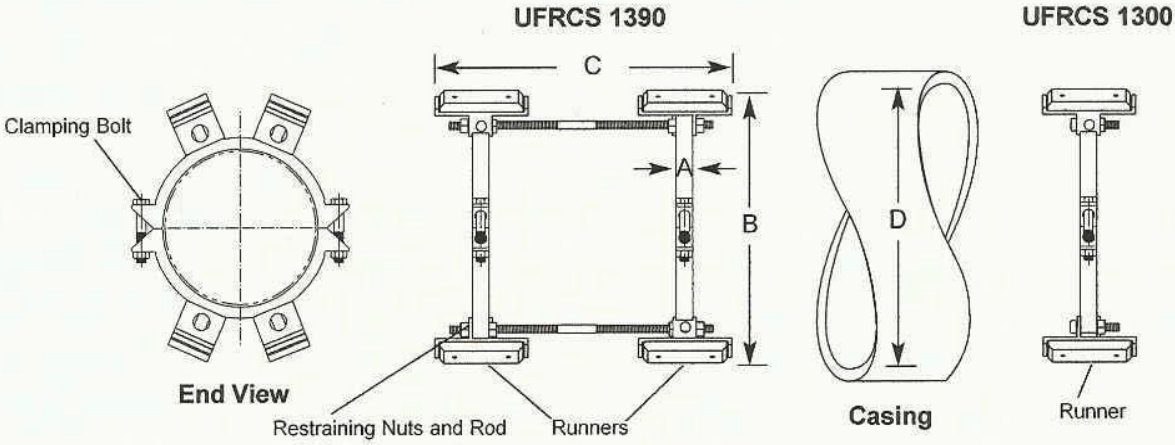
- High strength ductile iron, ASTM A536,65,000 psi tensile strength, 45000 psi yield strength, 12% elongation capability. (Grade 65-45-12)
- Restraining Rods/Nuts: High Strength, Low Alloy ASTM A242, ANSI/AWWA C111/A21.11
- Clamping Bolts / Nuts: SAEJ 429, Grade 5
- Runners: - Ultra high molecular weight polymer - Tensile Impact 600-1200 ft. lbs. / in^2
  - Coefficient of Friction .10 - ASTM D-1894 - Dielectric Constant 2.3 ASTM D- 150
  - Temperature Range -220 F. to +1800 F. continuous service
- 4" - 8" Sizes: Runners installed on tie rod ears and clamping bolt pads.

SUBMITTAL INFORMATION

Uni-Flange Series Casing Spacers 10" - 12" UFRCS



CASING SPACERS FOR SUPPORT OF 10" AND 12" PIPE BARREL AND PIPE BELL JOINT



RESTRAINED CASING SPACER FOR PIPE BELL JOINT - UFRCS1390

Nom. Pipe Size	Actual Pipe O.D.	Catalog Number	Approx. Shipping Weight	A	B (Approx.)	C (Approx.)	D Min. Casing Size (ID)	Runner Qty.	✓ Submitted Items
10"	11.10"	UFRCS1390-C-10	69.8	1-3/8"	19-3/4"	16"	21.5"	8	
12"	13.20"	UFRCS1390-C-12	75.8	1-3/8"	21-7/8"	18"	23"	8	

CASING SPACER FOR SUPPORT OF PIPE BARREL - UFRCS1300

Nom. Pipe Size	Actual Pipe O.D.	Catalog Number	Approx. Shipping Weight	A	B (Approx.)	C (Approx.)	D Min. Casing Size (ID)	Runner Qty.	✓ Submitted Items
10"	11.10"	UFRCS1300-C-10	33.1	1-3/8"	19-3/4"	N/A	21.5"	4	
12"	13.20"	UFRCS1300-C-12	36.1	1-3/8"	21-7/8"	N/A	23"	4	

FEATURES

- High strength ductile iron, ASTM A536, 65,000 psi tensile strength, 45,000 psi yield strength, 12% elongation capability. (Grade 65-45-12)
- Restraining Rods/Nuts: High Strength, Low Alloy ASTM A242, ANSI/AWWA C111/A21.11
- Clamping Bolts / Nuts: SAEJ 429, Grade 5
- Runners: Ultra high molecular weight polymer — Tensile Impact 600-1200 ft. lbs. / in^2
  Coefficient of Friction .10 ASTM D-1894 — Dielectric Constant 2.3 ASTM D-150
  Temperature Range -220 F. to +1800 F. continuous service
- 10" - 12" Sizes: Runners installed on tie rod ears.
- The UFRCS1390 provides joint restraint. The UFRCS1300 provides pipe support only.

The Ford Meter Box Company considers the information in this submittal form to be correct at the time of publication. Item and option availability, including specifications, are subject to change without notice. Please verify that your product information is current.

The Ford Meter Box Company, Inc.
P.O. Box 443, Wabash, Indiana U.S.A. 46992-0443
Phone: 260-563-3171 / Fax: 800-826-3487
Overseas Fax: 260-563-0167
http://www.fordmeterbox.com 04/09/01

Submitted By:

Link-Sear Modular Seal Model

Link-Seal EPDM Seal Elements

EPDM (Black)

Model "C" Link-Seal Modular Seal

Suitable for use in water, direct ground burial and atmospheric conditions. Provides electrical isolation where cathodic protection is required.
Type: Standard
Seal Element: EPDM (Black)
Pressure Plates: Composite
Bolts & **Nuts:** Carbon steel, zinc dichromate with proprietary corrosion inhibiting coating.
Temp. Range: -40 to +250°F (-40 to +121°C)*

Model "S-316" Link-Seal Modular Seal

For chemical processing & waste water treatment. EPDM rubber is resistant to most inorganic acids and alkalis, some organic chemicals (acetone, alcohol, ketones).
Type: Stainless
Seal Element: EPDM (Black)
Pressure Plates: Composite
Bolts & **Nuts:** 316 Stainless Steel
Temp. Range: -40 to +250°F (-40 to +121°C)*

Link-Seal Nitrile Seal Elements

Nitrile (Green)

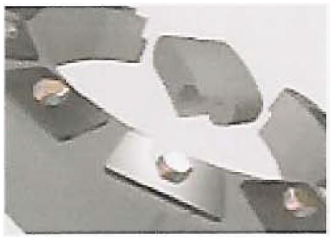
Model "O" Link-Seal Modular Seal

Nitrile rubber is resistant to oils, fuel and many solvents (gasoline, motor oil, kerosene, methane, jet fuel, hydraulic fluid, water, etc.).
Type: Oil Resistant
Seal Element: Nitrile (Green)
Pressure Plates: Composite
Bolts & **Nuts:** Carbon steel, zinc dichromate with proprietary corrosion inhibiting coating.
Temp. Range: -40 to +210°F (-40 to +99°C)*

Model "OS-316" Link-Seal Modular Seal

Combination of oil resistant rubber and stainless steel hardware.
Type: Oil Resistant
Seal Element: Nitrile (Green)
Pressure Plates: Composite
Bolts & **Nuts:** 316 Stainless Steel
Temp. Range: -40 to +210 °F

Link-Seal Silicone Seal Elements



Sjlicone (Grey)

Model 'T' Link-Seal Modular Seal

Silicone rubber is ideal for temperature extremes. "T" model is one hour Factory Mutual approved.
Type: High/Low Temperature
Seal Element: Silicone (Grey)
Pressure Plates: Steel zinc dichromate
Bolts: Carbon steel, zinc dichromate **with** proprietary corrosion inhibiting coating.
Temp. Range: -67 to +400°F (-55 to +204°C)*

Model "FD/FS" Link-Seal Modular Seal

Double seal for added protection.
Type: Fire Seals
Seal Element: Silicone (Grey)
Pressure Plates: Steel zinc dichromate
Bolts: Steel with 2-part zinc dichromate & organic coating.
Temp. Range: --67 to +400°F (-55 to +204°C)*

* = Sustained operation near temperature limits may affect life expectancy.

Link•Seal Modular Seal - Specifications

Material Properties of Link-Seal Seal Elements

PROPERTY	ASTM METHOD	EPDM	NITRILE	SILICONE
Hardness {shore A)	D-2240	47±3	50±5	50 ±5
Tensile	D-412	1450 psi	1300 psi	860 psi
Elongation	D-412	400"/o	300%	250%
Compression Set	S-395	15% 22 hrs. @ 158°F (70°C)	45% 22 hrs. @ 212°F (100°C)	40% 22 hrs.@ 350°F (177°C)
Specific Gravity	D-297	**1.10**	1.42	**1.40**

Material Properties of Composite Pressure Plates

PROPERTY	ASTM METHOD	VALUE
Izod Impact- Notched	D-256	2.05 ft-lb/in
Tensile Strength @ Yield	D-638	20,000 psi
Tensile Strength - Break	D-638	20,250 psi
Flexural Strength @ Yield	D-790	30,750 psi
Flexural Modulus	D-790	1.124,000 psi
Elongation, **Break**	D-638	11.07%
Specific Gravity	D-792	**1.38**
Moisture Content		0.18%

Bolt & Nut Specifications

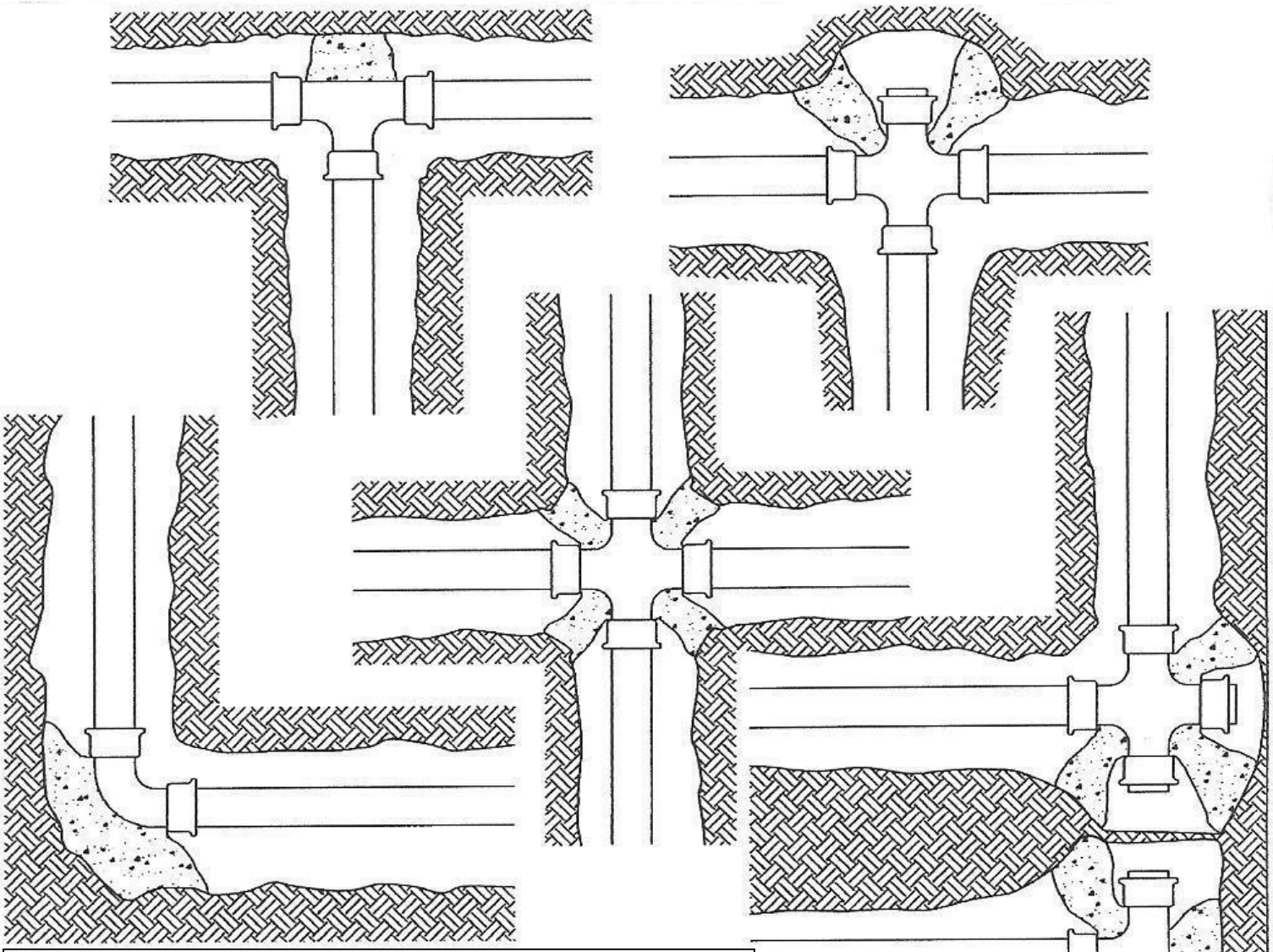
Standard: Carbon Steel
Carbon steel, zinc dichromate per ASTM 8633, with an additional corrosion inhibiting proprietary organic coating. (passes 1000 hour salt spray test)
Tensile Strength = 60,000 psi. minimum

Option: Stainless Steel
ANSI Type= **316,** Per **ASTM** F593-95
Tensile Strength= 85,000 psi, average.

Pipeline Seal and Insulator, Inc.
6525 Goforth Street. Houston TX 77021 U.S.A.
Tel: 713-747-6948, Fax 713-747-6029, Tdl Free: 800-423-2410
www.linkseal.com, e-mail: pipelineseal@att.net

La Grange Utilities Commission
Concrete Blocking Details

03-2004



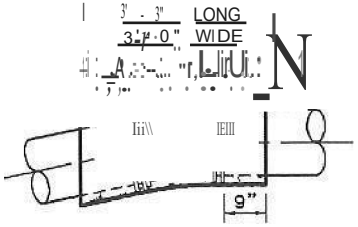
1. THRUST BLOCKS SHALL BE POURED AGAINST UNDISTURBED MATERIAL. WHERE TRENCH WALL HAS BEEN DISTURBED. EXCAVATE ALL LOOSE MATERIAL AND EXTEND THRUST BLOCK TO UNDISTURBED MATERIAL.

2. ON TEES AND BENDS EXTEND THRUST BLOCK LENGTH PLACE BOARD IN FRONT OF ALL PLUGS BEFORE POURING THRUST BLOCK. KEEP M.J. BELLS AND BOLTS FREE FROM CONCRETE BY WRAPING WITH 5 MIL PLASTIC LINER & TAPEING ENDS.

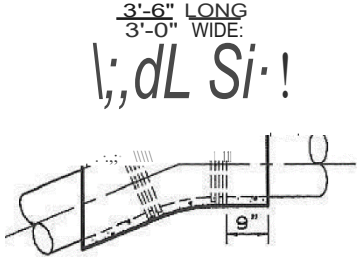
3. BACKFILL SHALL CONSIST ENTIRELY OF CLEAN SAND AND ROCK. ANY MUCK ENCOUNTERED SHALL BE REMOVEED AND REPLACED WITH ACCEPTABLE MATERIAL.

4. CONCRETE FOR THRUST BLOCKS SHALL HAVE A MINIMUM STRENGTH OF 3000 P.S.I. AFTER 28 DAYS.

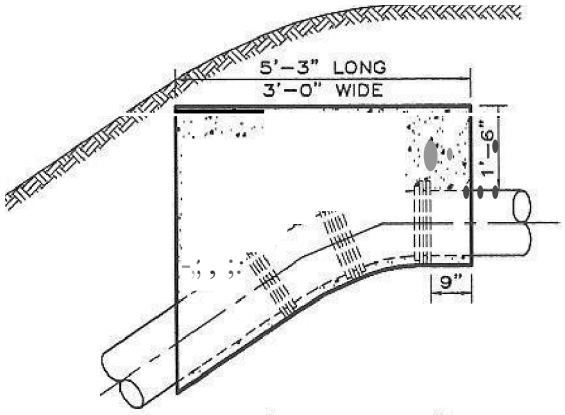
5. THRUST BLOCK SITES COMPUTED AT 150 P.S.I. PRESSURE AND 2000 P.S.F SOIL BEARING CAPACITY.



11 1/4·

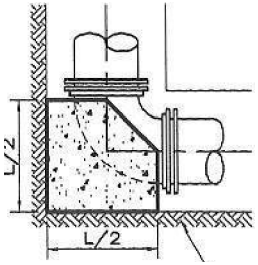


22 1/2·

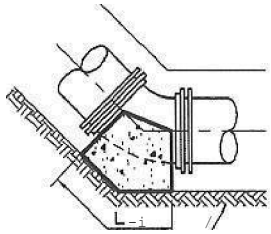


11 1/4· & 22 1/2'

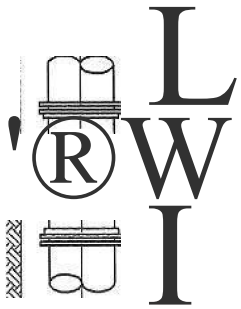
CONCRETE BLOCKING FOR VERTICAL BENDS



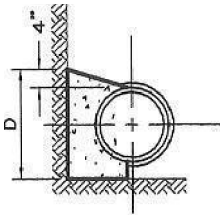
90' BENDS



BENDS LESS THAN 90'



TEES



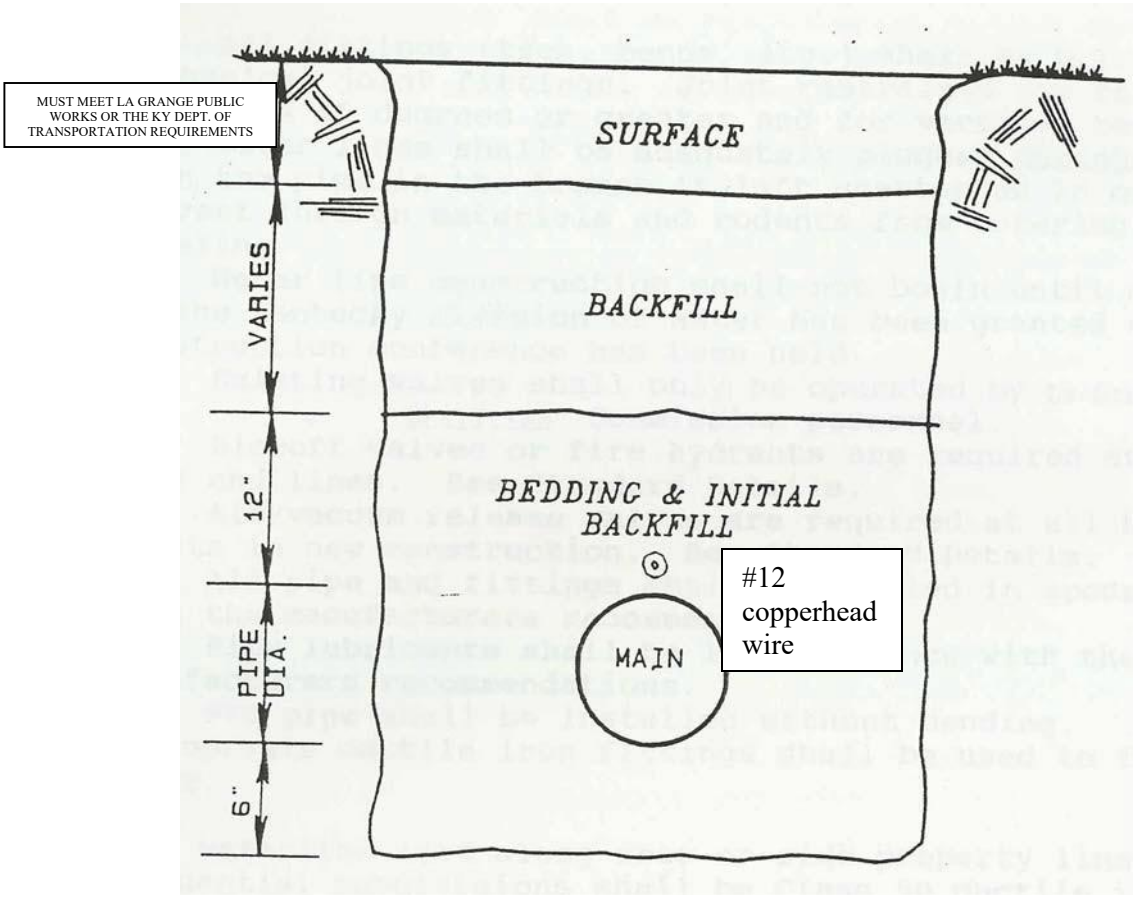
TYPICAL SECTION

CONCRETE BLOCKING FOR HORIZONTAL BENDS

BENDS								
SIZE OF PIPE	DEGREE OF BEND							
	11 1/4'		22 1/2'		45'		90'	
	L	D	L	D	L	D	L	D
13",4",6"	8"	6"	10"	6"	20"	6"	36"	6"
8"	9"	8"	14"	8"	24"	9"	50"	8
12"	14"	12"	22"	12"	30"	16"	60"	15"
16"	18"	16"	24"	16"	33"	36"	70"	22"

TEES								
RUN	BRANCH							
	3",4",6"		8"		12"		16"	
	L	D	L	D	L	D	L	D
3".4".6"	16"	7"						
8"	14"	8"	18"	12"				
12"	9"	12"	18"	12"	24"	18"		
16"	8"	16"	14"	16"	28"	16"	30"	26"

CONCRETE BLOCKING FOR WATER MAINS



NQTE: ROCK TREANCHERS AND PNEUMATIC HAMMERS ARE NOT ALLOWED UNLESS A TRENCH TWICE AS WIDE AS THE PIPE IS USED, WITH A MINANUM WIDTH OF 40". Deviations in specifications must have written approval from Director.

Surface

1. In turf areas, clean soil with no rock over 1.5 inches in maximum dimension in the top 12” of topsoil
2. Under existing or proposed pavement or sidewalk, use compacted D.G.A.

Backfill -

1. In turf areas, soil with no rock over 8 inches in maximum dimension.
2. Under existing or proposed pavement or sidewalk, *manufactured sand* or approved substitute or flowable fill where required. Jetting may be required per LUC

#12 solid copperhead tracer wire looped at all valve boxes including Fire Hydrant valve boxes.

Bedding and Initial Backfill

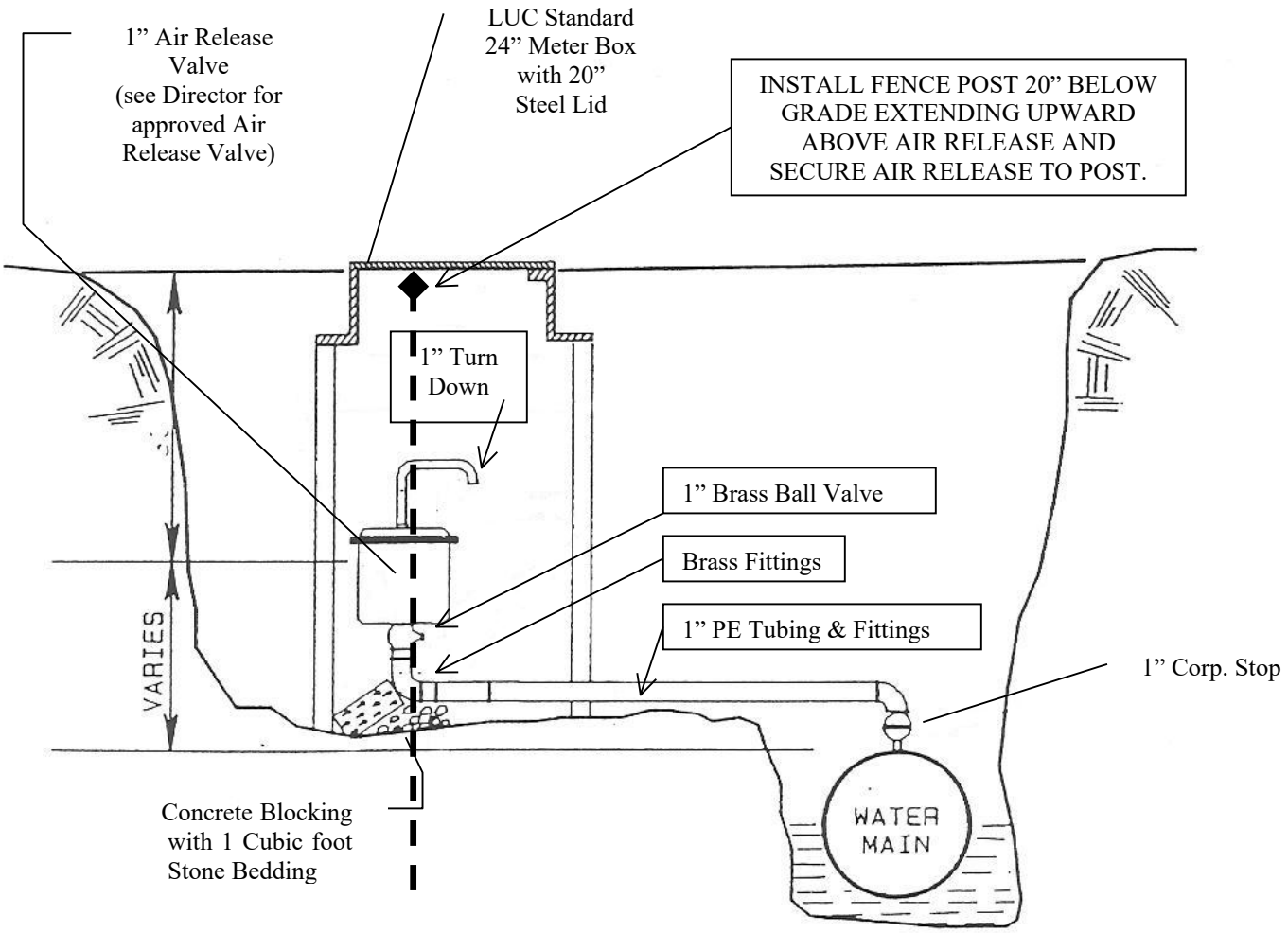
1. MANUFACTURED SAND IS REQUIRED

STANDARD DRAWINGS
LA GRANGE UTILITIES COMMISSION
412 E. Jefferson Street
LA GRANGE, KY. 40031

Water Line Trench

DATE: 3-1-98

Air Release Valve Assembly



STANDARD DRAWINGS

LA GRANGE UTILITIES COMMISSION

412 E. Jefferson Street

LA GRANGE, KY. 40031

Date 3-5-04

1. Air Release Valve Assemblies shall be placed at all high points in the system. The water main must be installed so that continuous upward slope is provided to all Air Release Assemblies.
2. Air Release Valve and Piping size shall be calculated for water mains larger than 8 inches in diameter.
3. Can be located directly above main with Directors approval.

La Grange Utilities Commission

GENERAL NOTES
WATER LINE CONSTRUCTION

1. It is understood that these specifications may be modified or deleted by the Director.

2. Unless otherwise specified IPS ULTRA-BLUE PVC is the required pipe and 8" minimum diameter.

3. All fittings (tees, bends, etc.) shall be D.I., mechanical joint coated fittings.

4. Water lines shall be adequately plugged during any time when the pipe in the trench is left unattended in order to prevent foreign materials and rodents from entering the pipeline.

5. Water line construction shall not begin until approval by the Kentucky Division of Water has been granted and a pre-construction conference has been held.

6. La Grange Utilities Commission personnel shall only operate existing valves.

7. Blow-off valves, flush hydrants or fire hydrants are required at all dead-end lines. See Standard Details.

8. Air/vacuum release valves are required at all high points in new construction. See Standard Details.

9. All pipe and fittings shall be handled in accordance with the manufacturer's recommendations.

10. Pipe lubricants shall be in accordance with the pipe manufacturer's recommendations.

11. PVC pipe shall be installed without bending. Appropriate Grip Ringed, as required by LUC, for ductile iron fittings shall be used to form a curve.

12. Waterline laid along rear or side property lines of residential subdivisions shall be Class 350 ductile iron or ULTRA-BLUE PVC pipe. Minimum cover in these locations shall be 36 inches. Water lines laid outside the right-of-way shall require an easement of 20ft for LUC only. The Director shall make exceptions as to the width of said easement.

13. Waterlines shall be pressure tested. See pressure test requirements.

14. All PVC pipe shall be laid with #12 solid copperhead wire and fittings. Locator wire directly above and tapped to the line so that the line can be located in the future. The wire shall be pulled up in all valve boxes including boxes on hydrant leads.

15. Water lines 10 inches or larger shall be ULTR-BLUE or Ductile Iron Class 350.

La Grange Utilities Commission

GENERAL NOTES
WATER LINE CONSTRUCTION

16. When water mains are laid in conjunction with street construction, 2 inch, SDR 21 glue joint only (or equal or better) encasement pipes with #12 solid copperhead locator wire shall be laid across the street at appropriate locations to facilitate future service connections.3 feet of Rebar shall be installed at the end of all casing pipe buried one foot below final grade. Also, a wooden 2" x 4" is required to be driven in the ground and to extend above ground by a min. of 2ft.. The developer will be responsible for any casings left out, or placed in areas under asphalt or concrete at their expense.

17. Water lines under streets shall be encased with a steel cover pipe or ductile iron pipe shall be used. See Casing & Boring Detail.

18. The La Grange Utilities Commission discourages the construction of dead-end water lines; therefore, water lines shall be looped wherever possible to aid in water quantity and quality for the benefit of consumers and fire protection.

19. New water lines shall be disinfected before they are placed in service by the use of chlorine or chlorine compound in such amounts as to produce an initial concentration of at least 50 ppm and a residual or at least 25 ppm at the end of 24 hours. Thorough flushing shall follow disinfection, until the chlorine residual is essentially the same as the existing water lines in service. Dechlorination is required to Division of Water Standards. Bacteria testing is required in accordance with Division of Water Regulations.

20. Where fire protection systems are constructed, a backflow preventer with double check valve equivalent to Watts No. 709 DDC is required with a detector meter. (see standard meter pit drawing with fire protection)

21. Where fire protection is provided by use of oversize meter, a compound meter with appropriate backflow protection for the potable water system shall be provided.

22. All water main installation and fire hydrant installation shall conform to the Minimum Fire Protection Requirements established by the Insurance Services Office of Kentucky and all local codes and standards.

23. Submittals on all materials should be presented to La Grange Utilities and written approval shall be required before construction may begin.

February 15, 2004

ROMAC INDUSTRIES, INC.
1-800-426-9341
MADE IN U.S.A.

GripRing™ Pipe Restrainer for D.I., C-900, and IPS size PVC

The GripRing's articulating wedge action provides the restraint required for virtually any pressure.

Full pipe circumference for restraint
This spreads the restraining forces more evenly than those using radial bolts or pads.

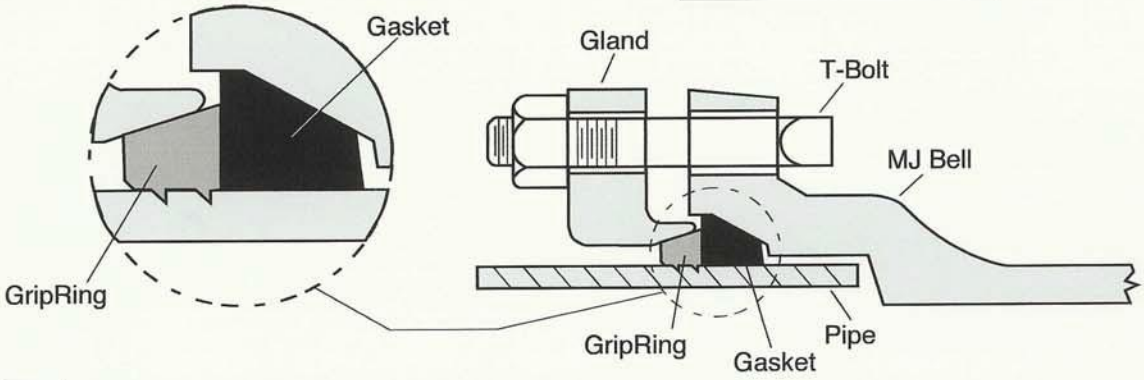
Easy to install
Uses standard mechanical joint gasket and T-bolts. No radial bolts or pads for the installer to forget to tighten! When the T-bolts on the gland are tightened, the GripRing restraint system is engaged.

Rated to full working pressure of pipe
GripRing pipe restrainers may be used at the full rated capacity of the pipe, including an allowance for pressure surges.

Built-in stop to prevent damage to pipe
The "gap" in each GripRing is designed to completely close before a pipe can be excessively stressed.

The Ring flexes to accommodate deflection allowed in a Mechanical Joint
Restrains under the misalignment conditions often found in the field.

The gland is painted yellow to avoid confusion
Since the gland used with the GripRing restraint system is similiar in looks to a standard MJ gland, it is painted yellow. The inspector can easily see that a restrainer has, in fact, been used.



STANDARD DRAWINGS

LA GRANGE UTILITIES COMMISSION
412 E. Jefferson Street
LA GRANGE, KY. 40031

Date 3-5-04

La Grange Utilities Commission

WATER PRESSURE TESTING REQUIREMENTS WATER LINE CONSTRUCTION

1. All water lines shall be pressure tested at 150 psi, normal operating pressure of the system or at the pressure class of the pipe, whichever is less, but 150 psi minimum test.

2. The Observer and/or the designated La Grange Utilities Commission personnel shall witness pressure testing.

3. The Contractor must make provisions for a positive test. For example, existing valves may leak, but this does not reduce the contractor's responsibility to prove a positive test.

4. Prior to testing, valves must be checked as to whether open or closed to verify that the test is for the appropriate sections of the systems.

5. The contractor shall provide a gauge of high accuracy, liquid filled, for the pressure test.

6. The pressure test itself shall be performed in the following manner:

   a. Pressurize the line to 150 psi. Normal operating pressure or the operating class of the pipe, whichever is less? If no pressure is lost after two hours and no leaks are observed, the test may be considered passing.

   b. If a pressure drop is observed, water shall be added to bring the pressure to the test pressure and the test shall be continued until it is assured that leakage does not exceed 10 gallons per day per inch diameter of pipe per mile of pipe.

   c. If allowable leakage is exceeded, the test shall be terminated until the cause of the leakage is determined.

   d. All observed leaks shall be repaired regardless of whether the allowable leakage is exceeded.

7. Testing must meet the requirements of the Kentucky Division of Water.

LAGRANGE UTILITIES COMMISSION

FIRE VAULT/DOMESTIC SERVICE

Fire service vaults shall include domestic water meter to be installed by LUC after a connection for the setter to be supplied by the contractor. Inspection will be made by LUC prior to acceptance and installation of domestic water meter.

1. Pre-cast steel reinforced concrete shall have a minimum thickness of 6 inches, concrete compressive strength of 4,000 psi @ 28 days and meet ASTM C-478 specifications. Lids shall be 8 inches thick reinforced concrete with gasket for watertight joint.
2. Fire service lines shall have a double detector check assembly with unit of measure reading gallons.
3. Pipe and fittings shall be ductile iron having Type 316 stainless steel nuts, bolts, and fasteners.
4. Gate valves shall have position indicators, ASTM B-98 stem, hand wheel and Type 316 stainless steel fasteners including, flange, bonnet, and stuffing box and wrench nut cap screw.
5. Pipe and valves shall have stainless steel support brackets and anchor bolts mounted to the concrete floor.
6. Mechanical couplings with stainless steel nuts, bolts and fasteners shall be used to connect ductile iron to plastic pipe outside the vault.
7. Interior pipe, valves and fittings shall be cleaned, properly prepared and coated with epoxy paint or approved alternative by the Director.
8. A stainless-steel mesh cover shall be provided on the discharge end of the valve vault drainpipe.
9. A 12-inch square aluminum hatch (not cast-iron meter cover) with recessed locking device shall be provided and centered over the domestic meter location.
10. A retractable aluminum access ladder manufactured by Bilco or approved equal shall be furnished and installed. The ladder shall be situated between pipes with a clear 4-foot square bottom landing.
11. All through wall pipes shall have flexible boot connectors with double stainless steel toggle type expansion bands.
12. A reproducible as-built drawing which shows exact tap, vault and water line locations shall be submitted to LUC for review and approval.

The attached detail for valve vault with fire meter is for typical installation having a 6-8” fire and 2-inch domestic water meter service in a minimum of a 6x8 pre-cast concrete vault. Actual sizes for pipe, meters, and other components shall be in accordance with National Fire Protection Association and Kentucky Division of Building Code enforcement requirements.

Fire Hydrants

1. Fire hydrants shall be located on the same side of the roadway as the water main and equipped with a STORTZ type cap.
2. The direction of fire hydrant cap opening, and color of fire hydrant nozzle caps shall be determined by the LaGrange Fire Department.
3. Fire hydrants shall be installed at all dead-end water mains.

Water Lines

1. No plastic water pipe shall be installed, removed and relayed.
2. Valve extensions shall be provided when necessary.
3. Pipe bedding and initial backfill shall be manufactured sand, but remaining backfill shall not include rock 6-8” in diameter.
4. All plastic water pipe shall be Ultra Blue.

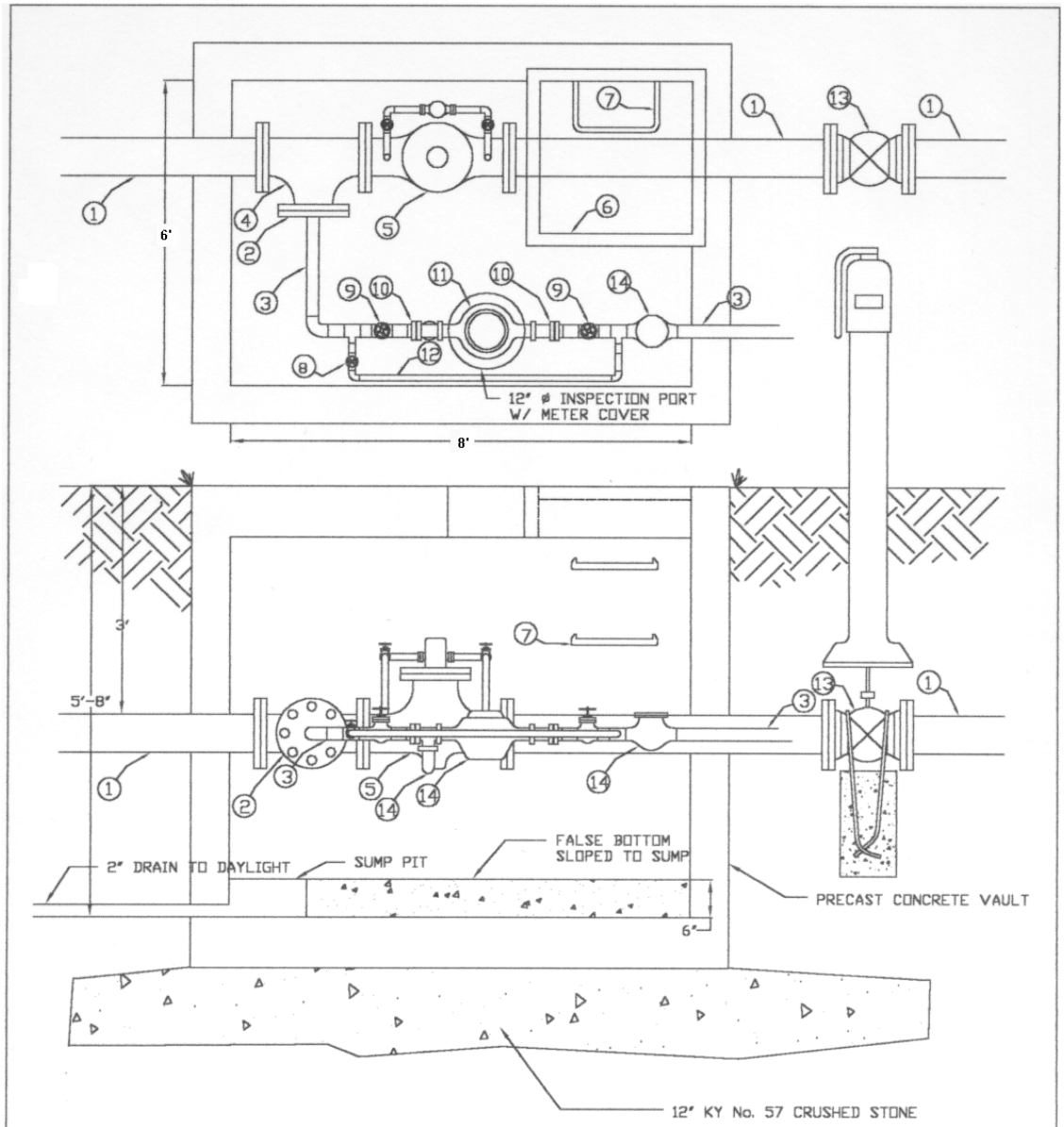
STANDARD DRAWINGS

LA GRANGE UTILITIES COMMISSION

412 E. Jefferson Street

LA GRANGE, KY. 40031

Date 3-5-04



1. 4" OR 6" DIP
2. 4" OR 6" BLINF FLANG
3. 1", 1-½", OR 2" - AS REQUIRED
4. 4" X 4" X 4" OR 6' X 6" X 6" DI TEE
5. 4" OR 6" DETECTOR CHECK VALVE ASSEMBLY
6. 24" X 24" ALUMINU, HATCH WITH LOCKING DEVICE
7. FACTORY INSTALLED STEPS
8. 1" IN LINE VALVE
9. 1", 1-½" OR 2" IN LINE VALVE - AS REQUIRED
10. 1", 1-½" OR 2" BRASS UNION - AS REQUIRED
11. 1", 1-½", OR 2" WATER METER W/STRAINER - AS REQUIRED
12. 1" METER BYPASS LINE
13. MJ GATE VALVE WITH INDICATOR POST & THRUST BLOCK
14. 1, 1-½" OR 2" CHECK VALVE

NOTE: PROVIDE APPROPRIATE SUPPORTS FOR PIPE AND FITTINGS IN VAULT

APPENDIX B

La GRANGE UTILITIES COMMISSION SANITARY SEWER SPECIFICATIONS AND STANDARD DRAWINGS

Sanitary Sewer Specifications and Standard Drawings

La Grange Utilities Commission

412 E. Jefferson St.
La Grange Kentucky
502-222-9325

Scot Treece
Director

Updated 1-10-22

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REVISED 09/08/2020

Section Page

STANDARD SANITARY SEWER SPECIFICATIONS

SS-1.0 GENERAL

SS-1.1 Description: Sanitary sewer construction shall consist of furnishing all labor, materials and equipment for the complete installation of sewers and appurtenances in accordance with the La Grange Utilities Commission Standard Drawings, Plans, General Provisions and Covenants, Street Specifications and Standards, and these Specifications.

SS-1.2 Design Requirements: Sewers shall be designed to meet LUC standards, LUC must review and approve all projects prior to submission to the Division of Water.

a. Minimum grade for gravity sewers are as follows:
   8" pipe - .9%
   All others shall be 2 times the 10 States Standard.

b. Sewer lines shall be placed in streets whenever possible. When it is apparent that other utilities will parallel the sanitary sewer, the sewer shall be placed at least 5 feet from the proposed location of these utilities. Sewer lines shall be placed a min of 5 feet from the limits of the easement. Sewer easements shall be a minimum of 30' and to LUC only. The Director shall make exceptions.

c. Sewer lines traversing rear or side property lines or if laid out of roadway shall be SDR 26 or class 350 lined ductile.

d. Manholes shall be placed where it is not likely that surface water will enter the manhole. Rim elevations shall be established above the 50-year flood elevation. If it is apparent after construction that surface water will enter the manhole, then "sewer guards" will be required.

e. Manholes in turf areas shall be constructed with a concrete pad formed around the manhole rim. The radius of the pad shall be 24" from the center of the manhole lid and have a minimum thickness of 4" with rebar for structural integrity. Exceptions to this requirement will be made on a case-by-case basis.

f. Six -inch sewer laterals for deep mains may be laid at 45-degree angle from the main to achieve a minimum of 4-6ft. depth. In rock, a vertical drop is permissible providing appropriate support is provided to prevent crushing the pipe.

g. The service line shall terminate at a cap. A 3-foot piece of rebar as well as a 4 to 10' foot 2 x 4 should be driven in the ground at the termination point.

h. Maximum spacing between manholes shall be 400 feet.

i. As-built drawings are required on all projects before acceptance of new construction.

j. The designing engineer shall certify by his own measurements that the manhole invert elevations shown on the "As Built" drawings are correct.

k. The developer is responsible for all manhole elevations. If elevations change for any reason the developer will raise elevation of manhole by LUC specifications. If a builder changes the elevations it shall be worked out between the builder and the developer.

l. Tying into existing manhole: Any tie in to an existing manhole shall be approved by the Director, and if approved, be inspected by LUC personnel. Coring and booting is the only approved method for a tie in of a LUC manhole. If someone breaks into a manhole, the whole manhole will be replaced at his or her expense.

m. Construction shall not begin until approval by the Kentucky Division of Water has been granted and a pre-construction conference has been held.

n. Force Main Pipe shall be laid with #12 Copperhead solid wire with copperhead connectors directly above in trench so that the line can be located in the future. The wire shall be pulled up in all valve boxes; valve boxes should be installed before the discharge manhole and at the beginning of the line such as the valve vault. If the force main is longer than 500 feet additional valve boxes may be required to access tracer wire.

o. Submittals on all materials should be presented to La Grange Utilities and written approval shall be required before construction may begin.

p. Refer to LUC water specifications for information on gate valves, tapping sleeves, grip rings, etc.

SS-1.3 Specification Modifications: It is understood that throughout these specifications may be modified or deleted by the Director.

SS-1.4 Revisions of Standards: When reference is made to a Standard Specification (ASTM, AWWA) the specification referred to shall be understood to mean the latest revision of said specification as amended at the time of the Notice to Bidders, except as noted on the Plans or in the Special Provisions.

SS-2.0 MATERIALS AND TESTING

SS-2.1 Scope: This section governs the furnishing of all pipe, fittings and other materials as required to complete the work as shown on the Plans and as provided for in the Special Provisions. The materials specified are to be used under normal conditions. Vitrified clay, HDPE, and fiberglass-reinforced pipe may be approved for special applications if installed by manufacturer's recommendations. Material submittals should be submitted to LUC for approval prior to the start of construction, Written approval is required prior to construction.

SS-2.2 General:

a. Requirements: Furnish pipe of materials, joint types, sizes, and strength class indicated and specified. Higher strengths may be furnished at Contractor's option if approved by the Director, at no additional cost to the Owner.

b. Manufacturer: The manufacturer shall be experienced in the design, manufacture and commercial supplying of the specific material.

c. Inspection and Testing: To be performed by the manufacturer's quality control personnel in conformance with applicable standards. Testing may be witnessed by Owner, Engineer, or approved independent testing laboratory. Upon request of the Owner, and prior to delivery, the Contractor shall provide three (3) copies of certified test reports indicating that material does conform to the specifications.

SS-2.3 Ductile Iron Pipe: Conform to ANSI A21.51, except as otherwise specified herein. (Epoxy lined or approved equal)

a. Design: Design of pipe shall be in accordance with ANSI A21.50 laying conditions B or F. Minimum wall thickness shall be for Class 2.
b. Joints: Mechanical and push-on joints for ductile iron pipe and fittings shall conform to the requirements of ANSI A21.11. (Epoxy lined or approved equal)
c. Gaskets shall be neoprene or other synthetic rubber material. Natural rubber gaskets will not be acceptable. Gaskets shall be rated for intended use (gravity sewer or pressure main).
d. Fittings: Fittings shall be in accordance with ANSI A21.10 and shall have a pressure rating of not less than that specified for pipe. Fittings used with ductile iron pipe shall be ductile iron. Fittings for pipe with mechanical joints shall have mechanical joints. Fittings for pipe with push-on joints shall be either mechanical joint or push-on joint. (Epoxy lined or approved equal)
e. Lining: Polyethylene in accordance with ANSI/ASTM D 1248 or two component epoxy per manufacturer's recommendations. Cement-mortar lining is not acceptable. Glass lined may be approved but will require written approval from the Director.
f. Coating: Bituminous per manufacturer's recommendations.
g. Furnish all specials, taps, plugs and wall fittings as required.

SS-2.4 Poly Vinyl Chloride (PVC) Sewer Pipe: Conform to ASTM D-3034, except as otherwise specified herein.

a. General: Furnish maximum pipe lengths manufactured by the supplier, except fittings, closures and specials.
b. Design: The minimum wall thickness for PVC Pipe shall conform to SDR-26. Pipe bedding shall conform to LUC specifications (section SS-4.4).
c. Joints: Flexible gasketed joints shall be compression type with a gasket confined in either the spigot end or the bell end of the pipe. Rubber gasket rings shall conform to the requirements of ASTM D-1869. Gaskets shall be neoprene or other synthetic material. Natural rubber gaskets will not be acceptable.

d. Fittings: Fittings defined as tee connections suitable for assembly to 6-inch house or building sewers connection to existing sewer mains shall be saddle-type fittings of PVC Plastic. Connections to new or inactive sanitary sewers shall be with Tee Wye fittings.

SS-2.5 Sanitary Sewer Force Main: Shall be PVC and conform to the requirements of Ultra Blue Only IPS or C909.

a. Bends in sanitary sewer force main shall be by restrained joint ductile iron fittings restrained in accordance with manufacturer's recommendations (**Restrain Joint is required on all mechanical joint fittings)**. Sanitary sewer force main shall be installed with locating tracer wire. Tracer wire shall be insulated #12 solid Copperhead with copperhead connectors. Tracer wire shall be secured to the top of the main by tape a minimum of 3 times in each standard length of pipe. Tracer wire shall be looped to the top of valve boxes for access and at ends for conductivity.

b. A valve box will be added to house the tracer wire where the force main dumps into a manhole.

c. Where sanitary sewer force mains must cross watermains, the force main shall be installed below the watermain with not less than a 24-inch separation.

d. Buried gate valves on force mains, two (2") inch through twelve (12") inch inclusive shall be Mueller Gate Valves, mechanical joint, resilient seated wedge disk or approved equal. Valve shaft shall have an "O" ring seal with a two (2") inch square operating nut. Valve shall open in a counter-clockwise direction. Buried gate valves shall have valve boxes which shall be two-piece, twenty-four (24") inch, screw type, bottom section and sixteen (16") inch screw type, top section with lid marked "SEWER". Gate valves to be epoxy coated and have all stainless-steel bolts.

SS-2.6 Reinforcing Steel: Reinforcing steel shall be placed as shown on the Plans and shall conform to ASTM Specifications as follows:

a. Bars and rods shall be deformed billet-steel conforming to ASTM A-615, Grade 40.

b. Welded wire fabric shall conform to ASTM A-185, Grade 40.

c. Fabricated steel bar and rod mats shall conform to ASTM A-184. Bar material shall conform to ASTM A-615, Grade 40.

d. Smooth bars shall be round carbon steel bars conforming to ASTM A-306, Grade 60.

SS-2.7 Manhole Materials:

a. General: Manholes shall conform to the applicable La Grange Utilities Commission Standard Drawing. (Flat top manholes are not allowed unless approved in writing by the Director) **All new manholes must be xypex and precast** as defined in these specifications and applicable La Grange Utilities Commission Standard Drawings. (Manholes must be moved with approved lifting rings and spreader bar, any damage to manhole will result in rejection from La Grange Utilities.)

b. Brick and mortar manholes: Repair to existing brick manholes use materials as follows:

1. Mortar: Mortar and plaster casting for masonry manhole units shall be two parts Portland Cement to one-part Masonry Cement to six parts plaster sand mixed with the least amount of potable water necessary to provide a workable mortar.

2. Brick: Clay brick shall conform to ASTM C-32, Grade SS or SM. For Grade SM, the maximum water absorption by 5-hour boiling shall not exceed 12.0 percent for individual brick or 9.0 percent for the average of five bricks.

c. Precast Concrete: Precast concrete manholes shall conform to ASTM C-478. Joints shall be of material as specified for reinforced concrete pipe joints or a bitumastic material or performed flexible joint sealants applied in accordance with manufacturer's recommendations.

d. Waterproofing: Waterproofing will be required to all manholes. 12" mastic wrap is required on the outside of all joints.

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e. Flexible connectors designed to produce a positive watertight connection for pipes entering precast manholes shall be provided. These connectors shall be the "A-LOK" produced by A-LOK Products, Inc. or approved equal such as a boot held with a stainless steel band and two stainless steel bands around the pipe. .

f. Interior coating: Where manholes are subject to excessive hydrogen sulfide exposure, the City requires manholes be lined with a one-part urethane Tnemec Series 434 Perma-Shield H2S or equal. Interior coating shall be applied prior to delivery to the site and touched up where necessary.

SS-2.8 Manhole Casting and Lid: Frame and lid shall be the standard La Grange Utilities Commission type as detailed in the LUC standard drawings for frame and lid.

a. Iron Castings:

1. Iron castings shall conform to La Grange Utilities Commission standard drawings.

2. Manhole rims and covers shall be machined or ground at touching surfaces to prevent rocking and to seat firmly. Any set not perfectly matched shall be removed and replaced at no cost to LUC.

3. Castings shall be clean and whole, and without blow or sand holes or any other surface defects which would impair serviceability. Plugging or filling of holes or other defects will not be permitted.

4. Parting fins and pouring gates shall be removed.

5. Castings shall be thoroughly cleaned and painted with two coatings asphaltum paint before being delivered to the site.

SS-2.9 Bedding Aggregate: All materials used for crushed stone pipe bedding shall conform to applicable City Standard Drawings.

a. For 8” and smaller pipe #68 stone required

b. For 10” and larger pipe #57 stone required.

SS-3.0 GRADING AND SITE PREPARATION

SS-3.1 Scope: This section governs the furnishings of all labor, equipment tools, materials, and the performances of all work for clearing, grubbing, and demolition, wholly or in any part, at locations shown on the Plans, or as provided for in the Special Provisions. Clearing, grubbing and demolition shall be done only to that extent which is necessary for the prosecution of the construction of the sewers.

SS-3.2 Definitions:

a. Clearing: Clearing shall consist of removing all vegetable matter, such as trees, brush, down timber, rotten wood, rubbish and other objectionable combustible materials, found on or above the surface of the site. It may include removing fences, lumber, waste dumps and trash, and the salvaging of such of the materials as may be specified. This item shall include the disposal of the debris resulting from the clearing operations.

b. Grubbing: Grubbing shall consist of removing and disposing of stumps, roots, buried trees and brush, wood piling, wood curb planking, wood culverts, wood catch basins and drains, and wood stairs appearing on or below the surface of the ground which has not been included in section entitled “Clearing”.

c. Demolition: Demolition shall consist of demolishing, removing, disposing, or incorporating into backfill all non-vegetable matter appearing above, on, or below the ground surface. This shall include all material derived from the demolition of Portland Cement Concrete items such as base courses, curbs, curb and gutters, sidewalks, floors, steps, driveways, drainage structures of all sorts, fences, and other miscellaneous items such as foundations or wall of any sort, and iron or steel items, and shall include all asphaltic items such as pavement and base courses.

SS-3.3 Construction Details:

a. Limits of Work: The limits for clearing, grubbing and demolition shall, in no case, extend beyond the limits of the right-of-way, city property lines, or easements, unless otherwise specified on the Plans or Special Provisions.

b. Protection of Existing Facilities: The Contractor shall be responsible for protecting any improvement of any agency, public or private, in the vicinity of clearing, grubbing or demolition operations. When necessary the Contractor shall enlist the assistance of the affected agencies in the location of their facilities. The Contractor will not be responsible for the cost to any agency for assistance in the location of its facilities, but he shall be responsible for the cost of all damages to such facilities arising because of his carelessness or negligence.

1. Private Sewer Facilities: The Contractor shall make every reasonable effort to protect private sewer facilities. They are not shown on the Plans. When these facilities are disturbed or damaged by the work, the Contractor shall make necessary repairs to the facilities for continuous service prior to the close of the work day.
2. Property Pins: All property or lot corner pins or stakes shown on the Plans and disturbed by this construction will be properly referenced by the Contractor prior to removal, and reset by a certified surveyor at the expense of the Contractor upon completion of the project.

SS-3.4 Clearing: Clearing shall be performed in advance of the construction operation so as not to delay the progress of the work. The refuse resulting from clearing shall be hauled to a waste site secured by the Contractor, or if permitted by the Special Provisions may be burned in the area indicated on the Plans in such a manner as to meet all applicable requirements of the Federal, State, County and Municipal regulations concerning health, safety and public welfare.

SS-3.5 Grubbing: Grubbing shall be kept abreast of the “Clearing” as nearly as the sequence of operations may permit. All stumps, roots, and other objectionable material within the disturbed area shall be removed to a depth of at least twelve (12) inches below the finished grade elevation. Disposal of debris from grubbing shall be as described in “Clearing” above.

SS-3.6 Demolition: If portions of existing improvements are to be left in place, the limits of pavement removal shall be laid out as neat, straight lines a minimum distance of six (6) inches beyond the anticipated edges of excavation. If the pavement removal limits are approximately parallel to and three (3) feet or less from an existing pavement joint, previous cut, or curb, the limits of removal shall be extended to the joint, cut, or curb. Sufficient portions of the pavement shall be removed to provide for the proper grade and alignment of the new construction. Disposal of debris from demolition shall be described in SS-3.4 "Clearing".

SS-3.7 Environmental Protection Procedures:

a. General: Contractor shall take all measures to minimize disturbed areas. Compliance with the following procedures for protection of existing greenery is required.

b. Trees: All reasonable effort shall be made to save as many trees as possible. If trees can be saved by trimming, this shall be done in accordance with acceptable pruning practices. Any tree removed shall be replaced with like species of nursery stock outside the temporary Sewer Right-of-Way. All trees within 30 feet of either side of sewer centerline which are specifically to be removed or saved have been marked on the Plans with the following notations.

    1. Trees marked "S" shall be saved.

    2. Trees "Xed" out shall be removed.

c. Shrubbery, Small Plants and Flowers: Prior to the start of construction, property owners will be notified of the proposed starting date. One purpose of this notification is so that the property owners may remove any shrubbery, small plants or flowers that they, the property owners, desire to save.

SS-4.0 PIPE LAYING, JOINTING AND TESTING

SS-4.1 Scope: This section governs the furnishing of all labor, equipment, materials and tools for the installation of all pipes, fittings, specials and appurtenances as shown on the Plans, City Standard Drawings or as provided for in the Special Provisions.

SS-4.2 Handling:

a. Handle pipe materials and fittings in a manner to insure installation in sound and undamaged condition. Do not drop or bump. Use slings, lifting lugs, hooks, and other devices designed to protect pipe, joint elements and coatings. In handling plastic pipe of ten (10) feet in length or greater, a double sling will be required unless otherwise approved by the Engineer or onsite inspector.

b. Ship, move and store with provisions to prevent movement or shock contact with adjacent units.

SS-4.3 <u>Installation</u>:

a. All work shall be in accordance with the following standards:

Ky State Division Of Water

La Grange Utilities Commission.

b. Utilize equipment, methods and materials insuring installation to lines and grades indicated.

1. Batter Boards and Laser: The Contractor shall provide and maintain in good working order, on the site, at all times, a laser beam (designed to lay a minimum of 400 feet) . The laser must be checked at the beginning of each day and at least once between manholes and at any other time the Engineer/Onsite Inspector or Director deems necessary to insure the proper line and grade of the pipe. Maintain the following tolerances from true alignment and grade:

Alignment	3 inches
Grade	1 inch

Joint deflection shall not exceed the maximum allowable deflection per joint according to ASTM C-425, ASTM C-594 and AWWA C-600. Only one correction for alignment and/or grade shall be made between adjacent manholes.

2. Except where pipe sections are being encased in concrete, no pipe is to be supported by blocks.

3. All transition in sewer main line and grade must be within a manhole.

c. Install pipe of size, material, strength class, and joint type with embedment as shown on the Plans. Reinforced concrete pipe with elliptical reinforcement shall be installed and positioned in accordance with the pipe manufacturer's pipe markings indicating top and bottom pipe.

d. Pipes installed on grades in excess of 20% shall be anchored securely with concrete anchors spaced as follows:

Grade	**Maximum Anchor Spacing**
20% - 35%	36 ft.
35% - 50%	24 ft.
greater than 50%	16 ft.

e. whenever possible, commence laying at downstream end of line and install pipe with spigot or tongue end downstream.

f. Clean interior of all pipe, fittings, and joints prior to installation. Exclude entrance of foreign matter during discontinuance of installation. Close open ends of pipe with snug fitting closures. Do not let water fill trench. Include provisions to prevent flotation should water control measures prove inadequate. Remove water, sand, mud and other undesirable materials from trench before removal of end cap.

g. Install pipe only when weather and trench conditions are suitable. Do not lay in water. Brace or anchor pipe as required to prevent displacement after establishing final position.

SS-4.4 Pipe Bedding: The sewer trench shall be carried to a point not less than six (6) inches below bottom of pipe bell. Crushed stone bedding, compacted to full width of trench, shall than be placed and compacted to bottom of pipe with proper allowance for bell joints. After each length of pipe being laid has been shoved "home" and placed in proper alignment, it shall be securely anchored and held in position by crushed stone deposited simultaneously on each side of the pipe. This crushed stone backfill shall extend to a point not less than twelve (12) inches above the top of the pipe bell. If unstable conditions are encountered and it is determined by the Engineer/Onsite Inspector that the bedding specified will not provide suitable support for the pipe, additional excavation to the limits determined by the Engineer will be required. This additional excavation shall be backfilled with crushed stone material approved by the Engineer. LUC observer, at their discretion, may require additional stone over pipe. Except in roadways, backfill above bedding shall be dirt with no stone over 8" diameter. Top 12" of the ditch line shall have no stone over 1.5" in diameter mixed with topsoil.

SS-4.5 Jointing:

a. General Requirements:
   1. Locate joints to provide for differential movements at changes in type of pipe embedment, concrete collars, and structures. Support pipe from wall of manhole to first joint in normal sewer trench with concrete cradle structurally continuous with base slab or footing.

   2. Clean and lubricate all joint and gasket surfaces with lubricant recommended by pipe manufacturer.

   3. Utilize methods and equipment capable of fully homing or making up joints without damage.

   4. Check joint opening and deflection for specification limits.

   5. Examine each piece of pipe prior to installation for soundness and specification compliance.

b. Provisions for Jointing PVC Pipe: Check gasket position and condition after assembly prior to installation of next pipe section.

SS-4.6 Cutting: Cut in neat workmanlike manner without damage to pipe. Observe specifications regarding joint locations. Smooth cut by power grinding to remove burrs and sharp edges.

Repair lining as required and approved.

SS-4.7 Temporary Plugs:

1. Plugs: Provide and install plugs as manufactured by pipe supplier or as fabricated by Contractor if approved. Plugs shall be watertight against heads up to twenty (20) feet of water. Secure plugs in place in a manner to facilitate removal when required to connect pipe.

2. Location: Plugs shall be installed as specified or where shown on Plans. Also the open end of the sewer shall be plugged at the end of the work day with a suitable mechanical plug to prevent entry of foreign material until work is resumed.

SS-4.8 Connections to Existing Pipelines and Structures:

a. Connect pipe to existing structures and pipelines where indicated. Observe pertinent articles of specifications pertaining to joint locations.

b. **This method only with Director approval.** Prepare structure by making an opening with at least two (2”) inches clearance all around fitting to be inserted. Connector gasket shall be placed on pipe. Pipe shall be positioned in manhole wall prior to grouting. Opening between pipe and manhole shall be filled with an expansive grout in such a manner that a watertight condition will result.

c. **This method only with Director approval.** Manholes to be built on an existing sewer shall be constructed in such a manner as will not disturb services of existing sewer. The manhole base, walls and invert shall be completed before the top half of the sewer pipe is cut or broken away. Rough edges of the pipe thus exposed shall be covered with expansive grout, in such a manner as to produce a smooth and acceptable finish. Any portion of the existing sewer damaged by the Contractor shall be repaired at no expense to the City.

d. Connections between different pipe materials shall be made using proprietary transition coupling unless otherwise specified on the Plans.

SS-4.9 Service Lines and Connections:

a. All property service connections shall be 6” in diameter unless otherwise specified.

b. Tee wyes and saddles for service lines shall be installed at a 45 degree angle measured from the horizontal center line of the pipe for pipe sizes eight inches (8”) through fifteen inches (15”) in diameter. Service lines shall not be

installed in pipe sizes 18 inches (18") in diameter or larger unless approved by the Director. Wyes shall be 8" x 6" with DVW branch and shall be installed on new sewer mains as the mains are installed. There shall be no Siamese connections of service lines unless approved by the Director.

c. Service lines under streets shall be installed by the Contractor/Developer extending from the main to the limits of the street right-of-way and shall be installed prior to construction of the street at a slope not less than two feet per 100 feet (2.0%). Service lines for each building unit shall be connected to the mains by means of a tee wye and shall extend at least to the street right-of-way, but never less than ten feet (10') from the sewer main. Individual service lines shall not connect directly into manholes unless approved by the Director. The only approved method for connecting directly into a manhole is to core and boot the manhole using a double stainless-steel strap on the boot. Inside the structure a tee must be installed and extended to the flow line and a section to the top of the structure. Service lines shall be adequately plugged to prevent foreign matter from entering the pipe during construction. All service lines shall be constructed bell to spigot or shall have a solid glued sleeve.

d. Saddles are only to be used to connect to existing sanitary sewers. The saddle shall be installed over a hole sized to fit the saddle opening (4" minimum). Cut shall be made with non-impact rotary equipment.

e. The service line shall terminate at a cap. A 3ft. piece of rebar as well as a 4 to 10' foot 2 x 4 should be driven in the ground at the termination point and tamped accordingly.

f. The Contractor/Developer shall maintain an accurate record for the production of the as-built drawings of the location, size and direction of each tee wye, and location, size and length of each building service line. Locations will be referenced to the pipe line stationing as shown on the plans, or the distance from the first downstream manhole.

SS-5.0 MANHOLES AND SPECIAL STRUCTURES

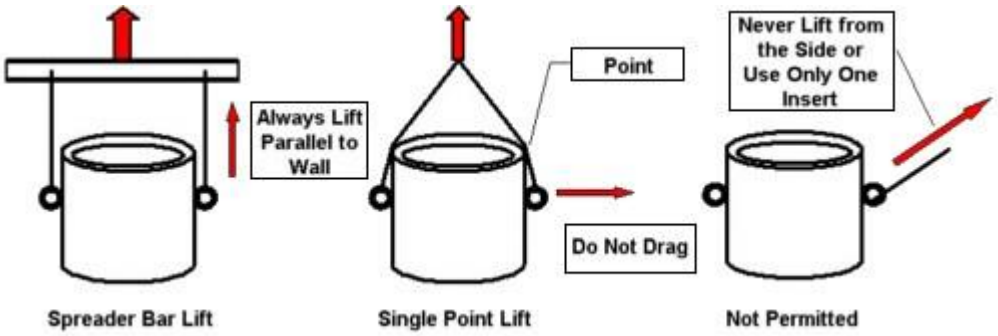
SS-5.1 Scope: This section governs the furnishing of all labor, equipment, tools and materials, and the performance of all work incidental to the construction of manholes, drop manholes and special sewer structures complete with covers, steps, fittings and appurtenances as required in accordance with the Plans, Special Provisions, and City Standard Plans.

SS-5.2 General: As used herein special structures refers to manholes on large sewers, special junction structures, metering stations, siphons and similar structures constructed on the pipeline. Manholes and special structures may be constructed of precast concrete sections, cast-in place concrete on existing mains or where space does not permit a precast manhole (only with Directors approval). All manholes are required to be in the roadway where possible. LUC will make no exceptions where it is possible to put sewers in the road. (Any deviation from this will require the Directors and Engineers approval). Cost should not be a factor in

determining the placement of sewer mains. Any manhole placed in earth areas shall have a minimum of 36" concrete collar.

SS-5.3 Handling:

a. Handle materials in a manner to insure installation in sound and undamaged condition. Do not drop or bump. Manholes must be moved with approved lifting rings and spreader bar, any damage to manhole will result in rejection from La Grange Utilities.



SS-5.4 Construction:

a. General: Manholes and special structures shall be constructed at locations indicated and in accordance with details as shown on the La Grange Utilities Commission Standard Drawings. Any manhole deemed to be in a location of corrosion, will be required to be lined with an epoxy sealer or approved equal for sealing out corrosion.

b. Precast Wall and Reducing Cone Sections: Handle with care to avoid damage to joint ends of each section. Damaged sections may be subject to rejection at the discretion of the Director or Observer. When using O-ring joints, care shall be exercised in placing the O-ring on the spigot end, and lowering the bell section on to the spigot end so that a watertight seal is obtained. When using bitumastic joints both spigot and bell ends shall be primed with solvent material compatible to the adhesive in the mastic. Approved bitumastic material shall completely fill the joints so that a minimum of one-fourth inch bead of material is visible after jointing, to be smoothed off after completion of the jointing operation. When a flexible preformed butyl rubber or bituminous polymer compounded with modifiers is used to seal jointed sections of manholes, the extrusion of sealant from the joint is not required. The vertical spacing between manhole sections shall not exceed one-fourth inch. Preformed joint sealers remain flexible at temperatures as low as 0 degrees Fahrenheit. All bitumastic materials or preformed flexible joint sealants shall not be applied to wet or damp surfaces.

c. Cast-in-Place: Consolidate concrete with mechanical vibrators to eliminate entrapped air voids and rock pockets. Forms shall be supported in such a manner as to prevent any movement of the forms while concrete is being

cured. Any movement of the forms may be cause for rejection. **(This method only with Directors approval)**

d. Invert Channels: Alignment of the invert channels shall be as shown on the Contract Drawings. When no specific details and dimensions are given, changes in flow direction shall be smooth, uniform and made with the longest radius possible. The cross-section shape of invert channels shall match the lower halves of the entering and exiting pipes. The surfaces of the channels shall be steel–troweled to produce a dense, smooth surface. When filling openings around pipes through manhole walls, mortar and/or masonry units shall be placed so that the resulting joints are watertight. Mortar used in the joint closure shall not interfere with the invert channel. **(This method only with Director's approval)**

SS-5.5 Curing: Cast-in-place concrete shall be adequately protected from freezing and loss of moisture for the first 24 hours. The curing methods and materials to be used shall be approved by the Engineer and Director.

SS-5.6 Manhole Rings: All rings for manhole covers shall be set to match the existing surfaces, except in flood plains where the Plans indicate that the ring is to be set at an elevation higher than existing ground. Each ring shall be set on a full mortar bed of bitumastic material, if approved by the Director or Observer

SS-5.7 Waterproofing:

b. All manhole joints are to be wrapped with 12" bitumastic wrap. All joints to be clean and dry when applied and installed on smooth surface.
c. Chimney seals to be installed on all manholes. Chimney Seals shall be installed in accordance with the Manufacturer's Specification for installation. The product manufacturer shall certify the Installer and proof of such certification shall be provided to La Grange Utilities Commission prior to installation of chimney seals. In addition, the installer shall carry a copy of his/her certification at all times during installation. Chimney Seals shall be installed after the binder course is placed when the manholes are constructed in roadways and after rough grading in all other areas.
d. Only 6 to 9 inches of concrete donuts may be used to raise manholes in streets. Plastic raisers may be allowed if approved by Director.

SS-6.0 PIPE ENCASEMENT AND COLLARS

SS-6.1 Scope: This section governs the furnishing of all labor, equipment, tools and materials, and the performance of all work for the encasement of pipe in concrete or installation of concrete collars at locations shown on the Plans.

SS-6.2 General: Tools or partial encasement of pipe in concrete shall be used where the required safe supporting strength cannot be obtained by other bedding methods. Concrete encasement shall also be provided at locations to protect public water supplies or where there exists the possibility that standard bedding may be eroded by currents of water under and around the pipe.

SS-6.3 Materials:

a. Concrete: Concrete whether reinforced or nonreinforced shall be approved by the Director. Reinforcing: Reinforcing steel used in concrete encasements shall be ASTM A-615, Grade 40.

SS-6.4 Construction: Concrete encasement shall be constructed at locations indicated and in accordance with details as shown on the Plans or City Standard Drawings. Start and terminate encasement at a pipe joint. Suitably support and block pipe to maintain position and prevent flotation. Form to dimensions indicated or construct full width of trench.

a. Joints: If a single section of encasement is not constructed continuously (concrete is not placed in a single deposit) construction joints shall be provided in the encasement to coincide with pipe joints. Construction joints shall be keyed continuously around the encasement. Longitudinal reinforcement shall be continuous through construction joints.

b. Curing: Concrete encasement shall be protected and cured so as to prevent excessive evaporation of moisture or freezing.

c. Backfilling: Backfill trench only after concrete encasement has set and can sufficiently support the loads imposed by backfill and backfill operations.

SS-7.0 BACKFILL

SS-7.1 Scope: This section governs the furnishings of all labor, equipment, tools and materials, and the performance of all operations necessary for the proper replacement of backfill material in pipe trenches.
General:

a. The backfill material when in roadways shall be manufactured sand, and shall be brought up to the sub grade of the roadway. (Min. amount of depth for sand shall be 5’ in depth)

b. Jetting of manufactured sand may be required.

c. Unless otherwise specified, all sewer trenches and excavation around structures shall be backfilled to the original surface of the ground with earth, earth and rock or other acceptable material. When earth and rock is used it shall be placed and thoroughly consolidated with sufficient earth to completely fill all voids between the rocks. The Contractor shall so sort and stockpile the excavated material so that the proper material is available for backfill. **No Rocks larger than 8” shall be used in the backfill in any direction and the top 12” of backfill shall contain no rock larger than 1.5” mixed with topsoil.**

d. The backfill material shall be compacted to a minimum of 80.0 percent of optimum density as determined by the Standard Proctor Test or shall be

compacted to a density equivalent to the density of the immediate adjoining soil. The top six inches of backfill in street right-of-way shall be compacted to a minimum density of 95.0 percent of optimum density as determined by the Standard Proctor Test. Backfill material shall be placed and compacted only when its moisture content is within 2.0 percent of optimum moisture content as determined by Standard Proctor Test.

e. The combination of the thickness of the layer, the method of compaction and the type of compaction equipment shall be at the discretion of the Contractor subject to obtaining the densities as specified above.

f. The quality of the compactions shall be subject to compaction tests when deemed necessary by the Engineer. It shall be the Contractor's responsibility to make necessary excavation in order to accommodate compaction tests at locations specified by the Engineer. The compaction tests will be performed at no cost to the Contractor. If the quality of the compaction does not meet the above requirements, the material will be removed and replaced to meet the above requirement, at the expense of the Contractor.

g. In areas marked "Garden" or "Flower Garden" on the Plans, the topsoil as excavated shall be stockpiled and replaced to original elevation, location and depth.

h. Backfill material shall be carefully placed to avoid damage or displacement of sewer or structures.

i. Backfill shall not be placed when material contains frost, is frozen, or a blanket of snow prevents proper compaction. Backfill shall not contain waste material, trees, organic material, rubbish, etc.

SS-7.2 <u>Backfill of Pipe Trenches</u>:

a. The area below a plane twelve inches above the top of pipe bell shall be backfilled in accordance with the specifications for "Pipe Bedding"

b. The backfill material when in roadways shall be manufactured sand, and shall be brought up to the sub grade of the roadway. (Min. amount of depth for sand shall be 5' in depth)

c. Backfill above a plane twelve inches above the top of pipe bell shall be made with suitable earth, (only when out of roadway) earth and rock, or other acceptable material except that the area below a plane one foot above the pipe bell shall not contain any excavated rock. When earth and rock is used, the maximum dimension of the rock shall not exceed 8 inches.

d. In some cases, the LUC Director or observer may require backfill to be the same as if it were in a roadway.

SS-7.3 Backfill Around Structure:

a. No backfill shall be placed over or around any structure until the concrete or mortar therein has set and can sufficiently support the loads imposed by the backfill without damage.

b. The Contractor shall use utmost care to avoid any wedging action between the side of the excavation and the structure that would cause any movement of the structure. Any damage caused by premature backfill or by the use of equipment on or near a structure will be the responsibility of the Contractor.

c. Backfill shall be placed and compacted on all sides of the structure simultaneously, and operations shall be so conducted that the backfill is always at approximately the same elevation on all sides of the structure.

d. No excavated rock larger than four (4) inches maximum diameter shall be placed within one (1) foot of the exterior surface of any structure

e. The area below a plane twelve inches above the top of pipe bell shall be backfilled in accordance with the specifications for "Pipe Bedding" Top soil in the top 12" rock shall not exceed 1.5".

SS-8.0 TUNNELING, BORING AND JACKING

SS-8.1 Scope: This section governs the furnishing of all labor, materials and equipment, and the performance of all operations necessary for the construction of tunnels complete with lining, bulkheads and sand fill at locations shown on the Plans or where constructed at the Contractor's option when approved to pass the utilities, streets or obstructions without open excavation.

SS-8.2 Tunnel Cross Section: Construct circular in cross section of size indicated. Alternate size and shape may be submitted for approval subject to the following:

a. Best suited to proposed method of excavation and lining.

b. Clear cross-sectional area not less than clear area of circular section indicated.

c. Invert at grade consistent with adjoining open cut construction.

SS-8.3 Materials:

a. Steel Casings: Steel casings for bored or jacked construction shall be steel pipe conforming to ASTM A-139 with minimum diameter as shown on the Plans.

1. Minimum wall thickness shall be in accordance with the following table:

Diameter	Nominal Wall Thickness of Casing Under Railroads	All Other Uses
24"	0.406"	0.281"
26"	0.438"	0.281"
28"	0.469"	0.312"
30"	0.469"	0.312"
32"	0.500"	0.312"
34"	0.500"	0.312"
36"	0.500"	0.344"

2. Steel shall be Grade B under railroads and Grade A on all other uses.

b. Joints:

1. Steel pipe shall have welded joints in accordance with AWWA C-206.

SS-8.4 Construction:

a. General: Before starting work, complete details of the method of operation and liner materials to be used shall be submitted to the Engineer. The sewer, in the area to be tunneled, bored or jacked, shall be completed before the construction of adjacent portions of the same sewer lateral. The purpose of this requirement is to allow for slight discrepancies in alignment and grade which may occur in the tunneled, bored or jacked installation, so minor adjustments in the adjacent sewer can be made. The maximum allowable deviation in alignment and grade of sewer pipe shall be as shown on the Construction Plans.

b. Excavation: Excavate by approved methods applicable to materials encountered. Boring operations shall be performed by experienced crews using a rotary-type boring machine designed especially for this purpose. Include dewatering and chemical soil stabilization or grouting if necessary due to existing field conditions. Conduct excavation in a manner to prevent disturbing the overlaying and adjacent material.

c. End Seals: Use only link seals unless another method approved by Director.

d. Casing spacers: Carrier pipe shall be supported inside the casing pipe per the City Standard Drawings.

SS-9.0 ACCEPTANCE TESTS FOR SEWERS

SS-9.1 Scope: This section governs the furnishing of all labor, equipment, tools and materials, and the performance of any or all acceptance tests as required by the Plans, Special Provisions, and these specifications. As-built drawings are required on all projects before acceptance of new construction.

A La Grange Utilities Commission approved representative must be on-site and approve all testing. *Additional test may be called for by the Director of the utility if improper work is noted or changes are made over a pipe trench, digging, excavating, etc.* Any pipeline found not conforming to these requirements shall be replaced by the

Contractor at no additional cost to the City, and shall then be retested. The City may, prior to the end of the warranty (guarantee) period, conduct another deflection test with City personnel. Any pipeline found not conforming to these requirements shall be replaced by the Contractor at no additional cost to the City, and the Contractor shall provide an additional warranty (guarantee) for not less than one (1) year for that portion of pipeline so replaced. The City also reserves the right to conduct deflection tests on any sewer installation. Mandrel shall be similar or equal to the "Wortco 9-Arm Mandrel" five (5) percent deflection for flexible or semi-rigid pipe as approved by the Director.

SS-9.2 Acceptance Tests for Gravity Sewers:

SS-9.2.1 Visual Inspection:

1. Contractor shall clean pipe of excess mortar, joint sealant and other dirt and debris prior to inspection. Method shall be by water ball cleaning or jetting.

2. Sewer will be inspected by flashing a light between manholes and/or by physical passage where space permits. Determine from illumination and/or physical inspection the presence of any misaligned, displaced or broken pipe and the presence of visible infiltration or other defects.

3. Correct defects as required prior to conducting leakage tests.

SS-9.2.2 Deflection Test: to be performed on the full length of all lines prior to acceptance.

1. A deflection test shall be performed on all gravity sewers. The test shall be performed after final backfill has been in place for at least 30 days. No pipe shall exceed a deflection of 5 %. The mandrel shall have a diameter equal to 95% of the inside diameter of the pipe. The test shall be performed without mechanical pulling devices.

SS-9.2.3 Exfiltration Leakage Test: to be performed on the full length of all lines over eighteen (18) inches I.D. prior to acceptance.

1. Contractor may perform leakage testing by exfiltration on sewer pipe larger than eighteen (18") inches I.D.

2. Furnish all labor, equipment, tools and materials required including bulkheads, water and all miscellaneous items required to perform the tests.

3. Test all sewer pipe over eighteen (18) inches I.D. when required by LUC after either the completed backfill or partial backfill sufficient to stabilize the position of the pipe in both alignment and grade is accomplished. Contractor may select sections of the project for testing at any time by notifying the Engineer 24 hours in advance.

4. Perform at depths of water as measured above centerline of pipe of not less than two (2) feet or more than ten (10) feet (consideration shall be given for water table above said centerline).

5. Maintain test as necessary to locate all leaks but not less than two hours.

6. Repeat as necessary after repair of leaks and defects until leakage, as measured, does not exceed 0.15 gallons per inch of internal diameter per hour per 100 feet of pipe length (200 gal/inch of I.D./day/mile).

7. Protect manholes and other structures by means of bulkheads to prevent bursting pressures from being applied inside the structure.

8. Dewater pipe upon completion of testing.

SS-9.2.4 <u>Air Leakage Test</u> to be performed on the full length of all lines prior to acceptance.

2. Contractor may perform air tests for all pipe sizes.

3. Furnish all facilities required including necessary piping connections, test pumping equipment, pressure gauges, bulkheads, regulator to avoid over- pressurization and all miscellaneous items required.

e. The pipe plug for introducing air to the sewer line shall be equipped with two taps. One tap will be used to introduce air into the line being tested, through suitable valves and fittings, so that the input air may be regulated. The second tap will be fitted with valves and fittings to accept a pressure test gauge indicating internal pressure in the sewer pipe. An additional valve and fitting will be incorporated on the tap used to check internal pressure so that a second test gauge may be attached to the internal pressure tap. The pressure test gauge will also be used to indicate loss of air pressure due to leaks in the sewer line.

f. The pressure test gauge shall meet the following minimum specifications:

Size (Diameter)	4 ½ inches
Pressure Range	0-15 P.S.I.
Figure Intervals	1 P.S.I. increments
Minor Subdivisions	0.05 P.S.I.
Pressure Tube	Bourdon tube or diaphragm ±0.25% of maximum scale reading
Dial	White coated aluminum with black lettering, 270-degree arc and mirror edge
Pipe Connection	Low male ½" N.P.T.

Calibration data will be supplied with all pressure test gauges. Certification of pressure test gauge will be required from the gauge manufacturer. This certification and calibration data will be available to the Engineer whenever air tests are performed.

4. Test each reach of sewer pipe between manholes after completion of the installation of pipe and appurtenances and the backfill of sewer trench.

5. Plug ends of line and cap or plug all connections to withstand internal pressure. One of the plugs provided must have two taps for connecting equipment. After connecting air control equipment to the air hose, monitor air pressure so that internal pressure does not exceed 5.0 psig. After reaching 4.0 psig, throttle the air supply to maintain between 4.0 and 4.5 psig for at least two (2) minutes in order to allow equilibrium between air temperature and pipe walls. During this time, check all plugs to detect any leakage. If plugs are found to leak, bleed off air, tighten plugs, and again begin supplying air. After temperature has stabilized, the pressure is allowed to decrease to 4.0 psig. At 4.0 psig, begin timing to determine the time required for pressure to drop to 3.0 psig. If the time, in seconds, for the air pressure to decrease from 4.0 psig to 3.0 psig is greater than that shown on the table below, the pipe shall be presumed free of defects.

Pipe Size	Required Time Per 100 LF	Maximum Required Time
8"	70 sec.	227 sec.
10"	110 sec.	283 sec.
12"	158 sec.	340 sec.
15"	248 sec.	425 sec.
18"	356 sec.	510 sec.
21"	485 sec.	595 sec.
24"	634 sec.	680 sec.
27"	765 sec.	765 sec.
30"	851 sec.	851 sec.
33"	935 sec.	935 sec.

If air test fails to meet above requirements, repeat test as necessary after all leaks and defects have been repaired. Prior to acceptance all constructed sewer lines shall satisfactorily pass the low-pressure air test.

6. In areas where ground water is known to exist, install a one-half inch diameter capped pipe nipple, approximately ten (10”) inches long, through manhole wall on top of one of the sewer lines entering the manhole. This shall be done at the time the sewer line is installed. Immediately prior to the performance of the line acceptance test, ground water level shall be determined by removing pipe cap, blowing

air through pipe nipple into the ground so as to clear it, and then connecting a clear plastic tube to pipe nipple. The hose shall be held vertically and a measurement of height in feet of water shall be taken after the water stops rising in this plastic tube. The height in feet shall be divided by 2.3 to establish the pounds of pressure that will be added to all readings.

SS-9.2.5 <u>Video Gravity Sewers:</u> to be performed on the full length of all lines prior to acceptance.

1. Video should be in color.

2. Video will include an audio narrative as well as a written description of findings.

SS-9.3 <u>Acceptance Tests for Pressure Sewage Force Mains</u>:

a. Perform hydrostatic pressure and leakage tests. Conform to AWWA C-600 procedures as modified herein. Test shall apply to all pressure sewers. Perform after backfilling.

b. Test separately in segments between sectionalizing valves, between a sectionalizing valve and a test plug, or between test plugs. Select test segments such that adjustable seated valves are isolated for individual checking. Contractor shall furnish and install test plugs at no additional cost to the Owner, including all anchors, braces and other devices to withstand hydrostatic pressure on plugs. Contractor shall be responsible for any damage to public or private property caused by failure of plugs. Limit full rate of line to available venting capacity.

c. Pressure Test: Conduct at 1.5 times maximum operating pressure determined by following formula: (**Or 150 PSI whichever is greater**)
   P pt = 0.650 (OP-GE) in which
   P pt = test pressure in psi at gauge elevation
   OP = operating pressure in feet as indicated for highest elevation of the hydraulic gradient on each section of the line.
   GE = elevation in feet at center line of gauge. Perform satisfactorily prior to determining leakage.

d. Leakage Test: Conduct at maximum operating pressure determined by following formula:
   P lt = 0.433 (OP-GE) in which
   P lt = test pressure in psi at gauge elevation
   OP and GE = as in previous article.

   3. All joints shall be watertight and free from leaks.

e. <u>Deflection Test</u>: Gravity pipeline #f flexible materials shall also be tested by pulling a mandrel. The test shall be conducted not less than one (1) month

after backfill has been properly installed. The maximum allowable deflection shall not exceed five (5) percent of the pipe's internal diameter.

SS-9.5 Acceptance Test for Manholes

All manholes shall be vacuum tested by the contractor at his expense. The Contractor will furnish appropriate equipment and manpower for this purpose. When vacuum testing manholes, the following criteria are to be used:

1. This method is applicable to all manholes.

2. All lift holes shall be plugged with an approved non-shrink grout.

3. No standing water shall be allowed in the manhole excavation that may affect the accuracy of the test.

4. All pipes and other openings into the manhole shall be plugged and securely braced to prevent displacement of the plugs while the vacuum is drawn.

5. Installation and operation of vacuum equipment shall be in accordance with equipment specifications and instructions provided by the manufacturer.

6. A vacuum of 10 inches of mercury shall be drawn and the vacuum pump shut off. The time for the vacuum to drop to 9 inches of mercury shall be recorded.

7. Acceptance for four (4) foot diameter manholes shall be defined as when the time to drop to 9 inches of mercury meets or exceeds the following:

Manhole Depth	Diameter	Time to Drop 1" of HG
10 ft. or less	4 ft.	60 seconds
10 ft. to 15 ft.	4 ft.	75 seconds
15 ft. to 20 ft.	4 ft.	90 seconds

1

8. For manholes five (5) foot in diameter, add an additional 15 seconds and for manholes six (6) foot in diameter, add an additional 30 seconds to the time requirements for four (4) foot diameter manholes. +If the manhole fails to test, necessary repairs shall be made with a non-shrink grout while the vacuum is still being drawn. Re-testing shall proceed until a satisfactory test is obtained.

SS-10.0 SEEDING

SS-10.1 Scope: This section governs the furnishing of all labor, equipment, tools and materials, and the performance of all work for seeding, complete as

specified in the Special Provisions and/or as shown on the Plans. All grassed areas disturbed which lie outside the Contractor's normal trenching operation areas shall be restored to a condition equal to or better than existing prior to construction. All provisions of Section TS-9 shall apply except as amended herein.

SS-10.2 The seeding mixture used to seed areas off street rights-of-way that are not maintained shall be as follows:

Kind of Seed	Min. Pure Live Seed (%)	Rate Lbs. Per Acre
Alta Fescue or Kentucky 31 Fescue (Festuca Eliator Var. Arundinces)	75	90
Rye Grass (Lolium Perenne 80 or L. Miltiflorum)	80	50
Total		140#/acre

SS-10.3 Sowing shall be accomplished by use of an approved mechanical seeder or drill (hand spreader can be used in small area), making sure that successive seed strips overlap to provide uniform coverage. Seed should be drilled to a depth of one-half (½") inch.

SS-11.0 PAVEMENT REPLACEMENT

SS-11.1 Scope: This Section covers the furnishing of all labor, equipment, tools and materials, and the performance of all work for the replacement of pavement including sidewalks, driveways, and curbing, as specified on the Plans in the Special Provisions.

SS-11.2 Definitions: Pavement, as used herein, shall include Portland Cement Concrete (PCC), asphaltic concrete, asphaltic and lime or cement treated surface courses, and other similar types of construction, including sidewalks, driveways, and curbing. Replacement, as used herein, shall mean reconstruction of the entire structural section of all pavements removed in excavated areas, including sidewalks, driveways, and curbing, and reconstruction or restoration of damaged pavement surfaces outside of excavation limits.

SS-11.3 General: In all areas of pavement removal replace pavement upon completion of sewer installation. All pavement not designated for removal that is damaged by the Contractor's operations shall be required, restored or replaced depending upon the degree of damage.
Prior to pavement replacement, all edges that were previously cut but have been subsequently damaged, shall be re-cut, and all adjacent undermined and heaved pavement shall be removed to the edge of the undisturbed trench.

SS-11.4 Pavement Replacement:

a. General: Removed pavement shall be replaced in conformance with the typical sections shown on the City Standard Drawings, Plans, and Technical Street Specifications, the requirements specified in the Special Provisions, and will generally be replaced in kind. Replacement shall include construction of all courses upon the subgrade for a complete pavement structural section. Restoration of damaged surfaces shall be as directed by the Engineer. Final pavement joints must be parallel or perpendicular to the street centerline.

b. Subgrade Compaction: Subgrade compaction shall conform to SS-7.0.

SS-12.0 MEASUREMENTS AND PAYMENTS

SS-12.1 Scope: This section covers the method of measurement and basis of payment for the furnishing of all labor, equipment, tools and materials and for the performance of all related work necessary to complete the sewer and appurtenances. (This section only applies if the contractor is being paid by the Utility not a Developer.)

SS-12.2 Method of Measurement: The amount of completed and accepted work shall be measured or determined as follows:

1. Pipe Sewer:

    a. Open Trenched: Measurement of various size, type and depth pipe sewer will be in linear feet, as listed on the Bid, based on the true length of pipe computed from inside wall to inside wall of manholes along centerline of pipe sewer. Depth range as listed on the Bid and shown on the Plans is the average trench depth between adjacent manholes and will not be measured unless changed field conditions result in a change in the Plans by the Engineer.

    b. Tunneled, Bored or Jacked: Measurement will be made in linear feet for the applicable size of cast iron pipe sewer, tunneled, bored or jacked as listed in the Bid, based on the true length of pipe shown on the Plans, unless changed in the field by the Engineer.

2. Manholes: Measurement will be made for the applicable type, size and depth of manholes as listed in the Bid. The manhole depth shall be determined by measuring from top of casting to outlet pipe flowline.

3. Encasement: Standard concrete encasement will be measured in linear feet for the applicable size pipe, as listed in the Bid. Concrete collars will be measured as one (1') linear foot of concrete encasement based on true length of encasement along the centerline of pipe.

4. Seeding: Seeded areas will be measured horizontally in linear feet along centerline of sewer, regardless of width of disturbed area or type of seed used. Seeding will be measured only when centerline of sewer lies in grassed areas

to be seeded, as shown on the Plans. When centerline of sewer lies in areas that are not grassed, such as street paving, driveways, parking areas, gardens, etc., no measurement will be made. Areas that are disturbed which lie outside the Contractor's normal trenching areas will not be measured for payment, but shall be restored to condition equal to or better than that existing prior to construction. When sewer ends in a grassed area, measurement will be made only to centerline of manhole.

5. Rock: Measurement of the quantity of excavated rock will be in cubic yards, as listed in the Bid, based on the true lengths and depths as measured in the field. Pay line width shall be the outside diameter of the pipe plus twelve (12") inches. The minimum pay line width shall be twenty-four (24") inches.

SS-12.3 <u>Basis of Payment</u>

Payment for the completed and accepted work shall be made as follows:

1. Pipe Sewer:

    a. Open Trenched: Payment will be made at the contract unit price per linear foot for the applicable size, type and depth of pipe sewer, as listed in the Bid. Such payment and price shall constitute full compensation for all labor, materials, equipment and for the performance of all work necessary to complete the sewer, including excavation, sheeting and shoring, dewatering, preparation of bedding, installation of pipe sewer, backfilling, compaction, disposal of excess materials and replacement of pavement.

    b. Tunneled, Bored or Jacked: Payment will be made at the contract unit price per linear foot for cast iron pipe sewer, tunneled, bored or jacked as listed in the Bid. Such payment and price shall constitute full compensation for all labor, material, equipment and for the performance of all work necessary to complete the sewer, including all excavation, sheeting and shoring, dewatering, installation of casing pipe, tunnel liner plate, grouting, installation of carrier pipe, sand fill, end seals, backfilling compaction and disposal of excess material, including all cost of jacking and pit(s).

2. Manholes: Payment will be made at the contract unit price per each for the applicable type, size and depth of manholes as listed in the Bid. Such payment and price shall constitute full compensation for all work necessary to complete the manholes, including excavation, sheeting and shoring, dewatering, concrete base, manhole steps, manhole ring and cover, waterproofing, reinforced concrete, backfilling, compaction and disposal of excess material.

3. Encasement: Payment shall be made at the contract unit price per linear foot of encasement, for the applicable size pipe as listed in the Bid. Such payment shall constitute full compensation for all labor, materials, equipment and for the performance of all work necessary to complete the item, including reinforced concrete collars.

4. Seeding: Payment will be made at the contract unit price per linear foot for seeding, regardless of type of seed, as listed in the Bid. Such payment shall constitute full compensation for all labor, materials, equipment and work necessary to complete the item, including grading, tilling, fertilizing, seed application, compaction and mulching.

5. Rock: Payment will be made at the contract unit price per cubic yard, as listed in the Bid. Such payment and price shall constitute full compensation for all labor, material, equipment, and all work necessary to complete the rock removal.

SS-13.0 SUBSIDIARY ITEMS

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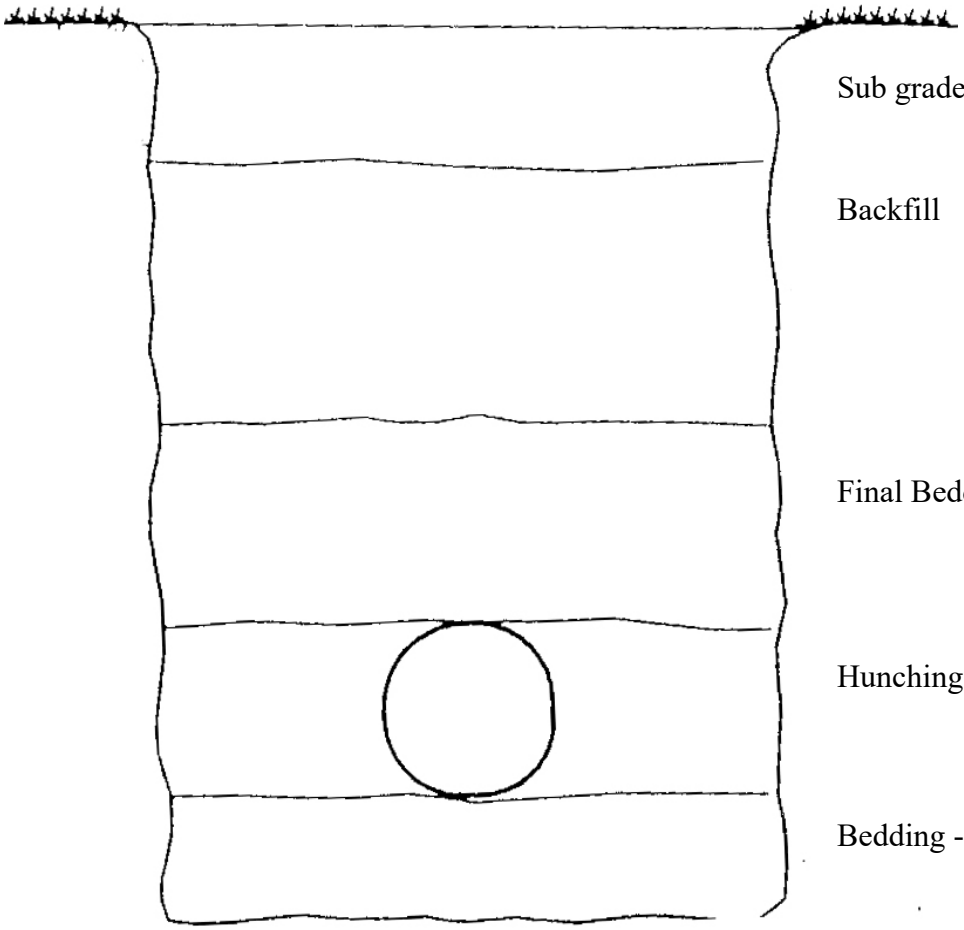
Sewer Pipe Bedding



Sub grade - 1. In turf areas, clean soil with no rock over 1.5 inches
2. Under existing or proposed pavement or sidewalk, conform to City road Spec.

Backfill - 1. In turf areas, soil with no rock over 6 inches in dimension
2. Under existing or proposed pavement or sidewalk, use jetted manufactured sand, or # 57 crushed stone.

Final Bedding - Min. 12 inches above top of pipe.
For 8" and smaller pipe #68 stone required
For 10" and larger pipe #57 stone required.

Hunching Bedding - Area around pipe.
For 8" and smaller pipe #68 stone required
For 10" and larger pipe #57 stone required

Bedding - Min. 6 inches below bottom of pipe.
For 8" and smaller pipe #68 stone required
For 10" and larger pipe #57 stone required.

LA GRANGE UTILITIES COMMISSION NOTES:

At selected low points in topography, install perforated pipe under drains to drain upstream pipe bedding.

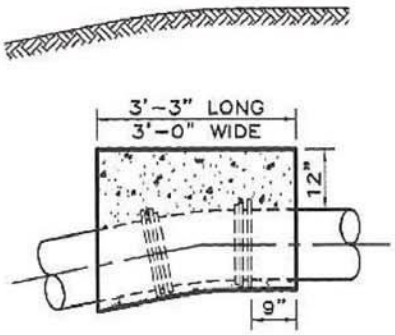
All rock backfill must be even across the ditch before the next layer of backfill is installed.

Stranded # 8 copper tracer wire placed on force mains and taped to pipe as well as looped at all valve boxes. Valve boxes should be placed every 600 feet for tracer wire access.

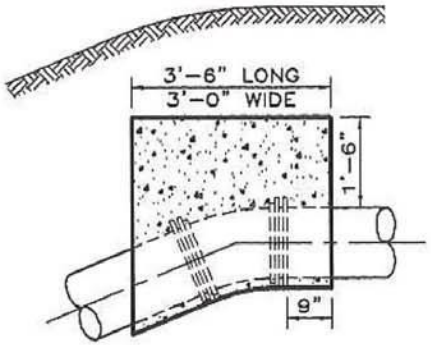
STANDARD DRAWINGS

LA GRANGE UTILITIES COMMISSION
412 E. Jefferson Street
LA GRANGE, KY. 40031

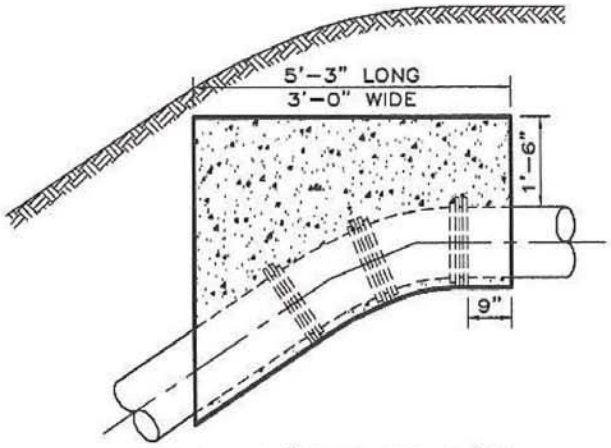
Date 3-1-2006



11 1/4°

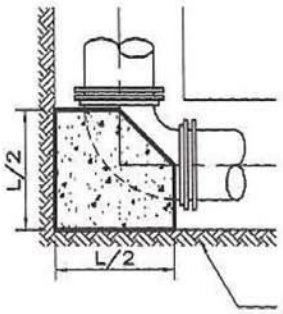


22 1/2°

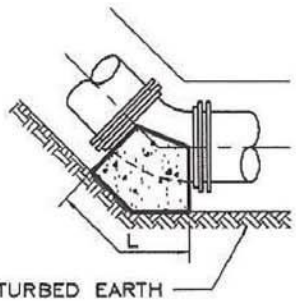


11 1/4° & 22 1/2°

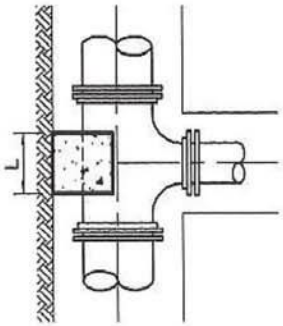
CONCRETE BLOCKING FOR VERTICAL BENDS



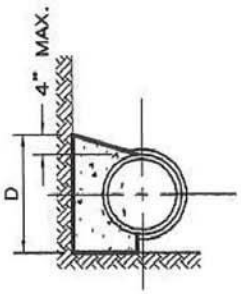
90° BENDS



BENDS LESS THAN 90°



TEES



TYPICAL SECTION

CONCRETE BLOCKING FOR HORIZONTAL BENDS

BENDS

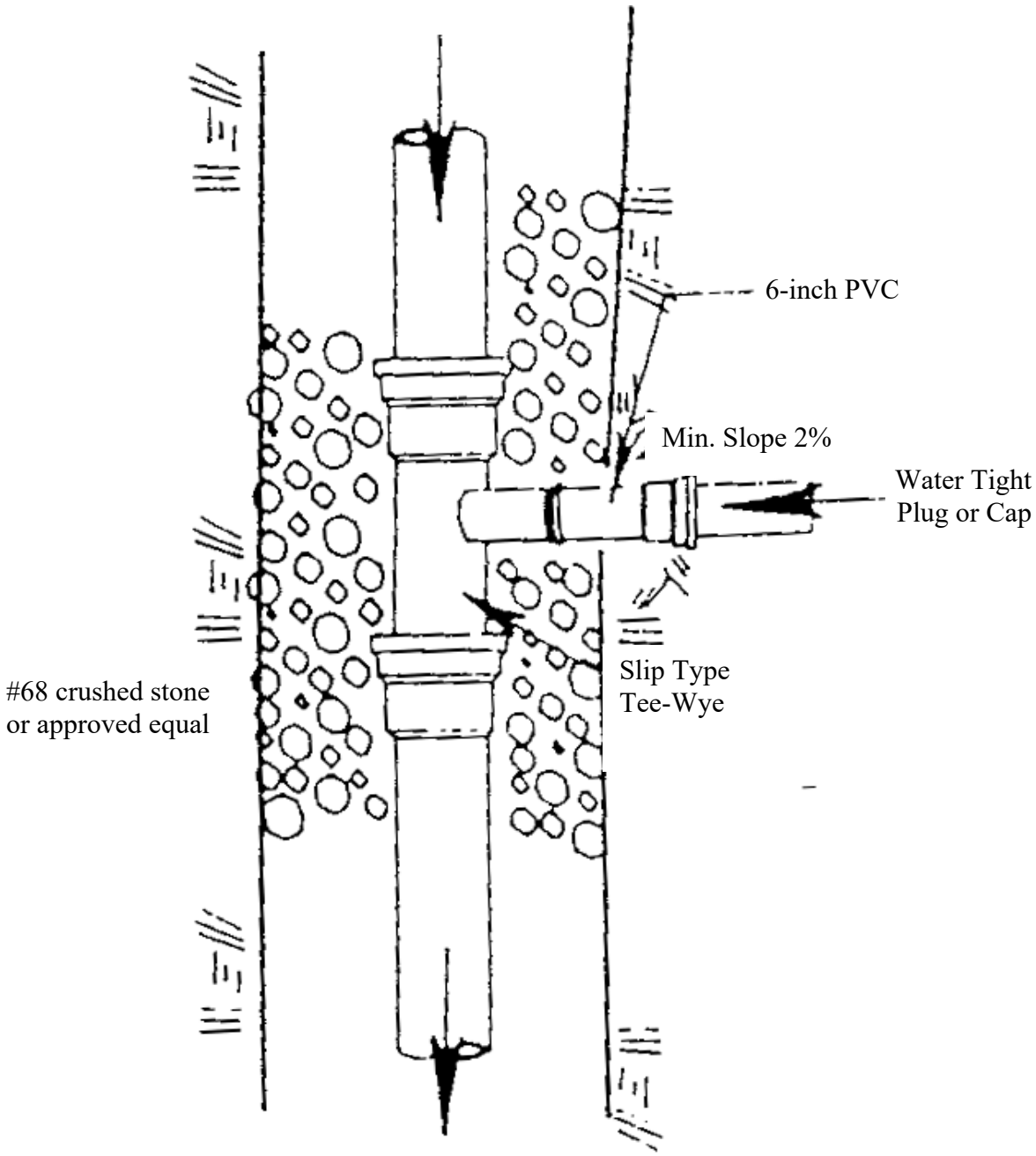
SIZE OF PIPE	DEGREE OF BEND							
	11 1/4°		22 1/2°		45°		90°	
	L	D	L	D	L	D	L	D
3",4",6"	8"	6"	10"	6"	20"	6"	36"	6"
8"	9"	8"	14"	8"	24"	9"	50"	8"
12"	14"	12"	22"	12"	30"	16"	60"	15"
16"	18"	16"	24"	16"	33"	36"	70"	22"

TEES

RUN	BRANCH							
	3",4",6"		8"		12"		16"	
	L	D	L	D	L	D	L	D
3",4",6"	16"	7"						
8"	14"	8"	18"	12"				
12"	9"	12"	18"	12"	24"	18"		
16"	8"	16"	14"	16"	28"	16"	30"	26"

Concrete Blocking For Sewer Force Mains

Typical Plan View for Sewer Connection

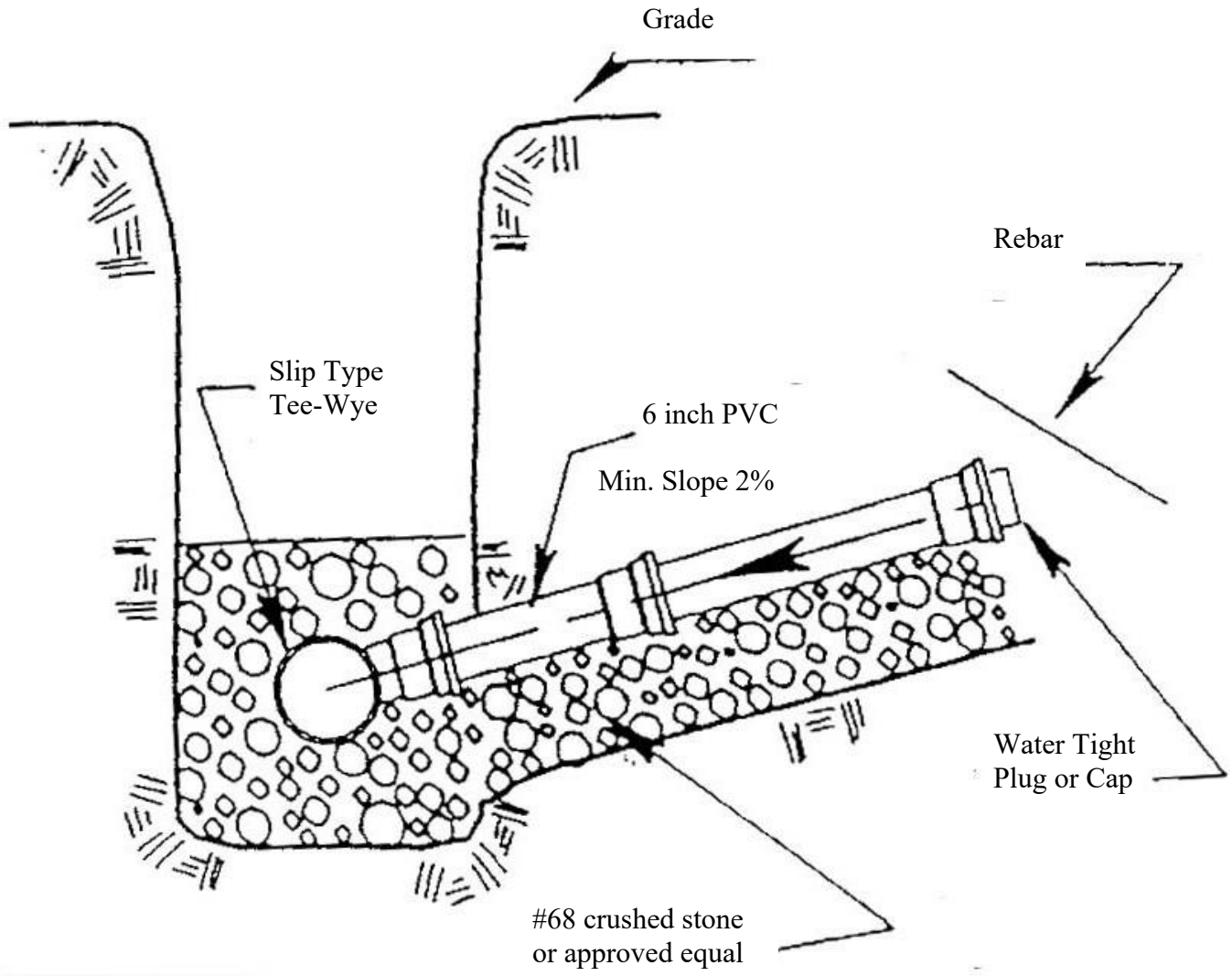


STANDARD DRAWINGS

LA GRANGE UTILITIES COMMISSION
412 E. Jefferson Street
LA GRANGE, KY. 40031

Date 3-1-2006

House Connection For Shallow Sewer

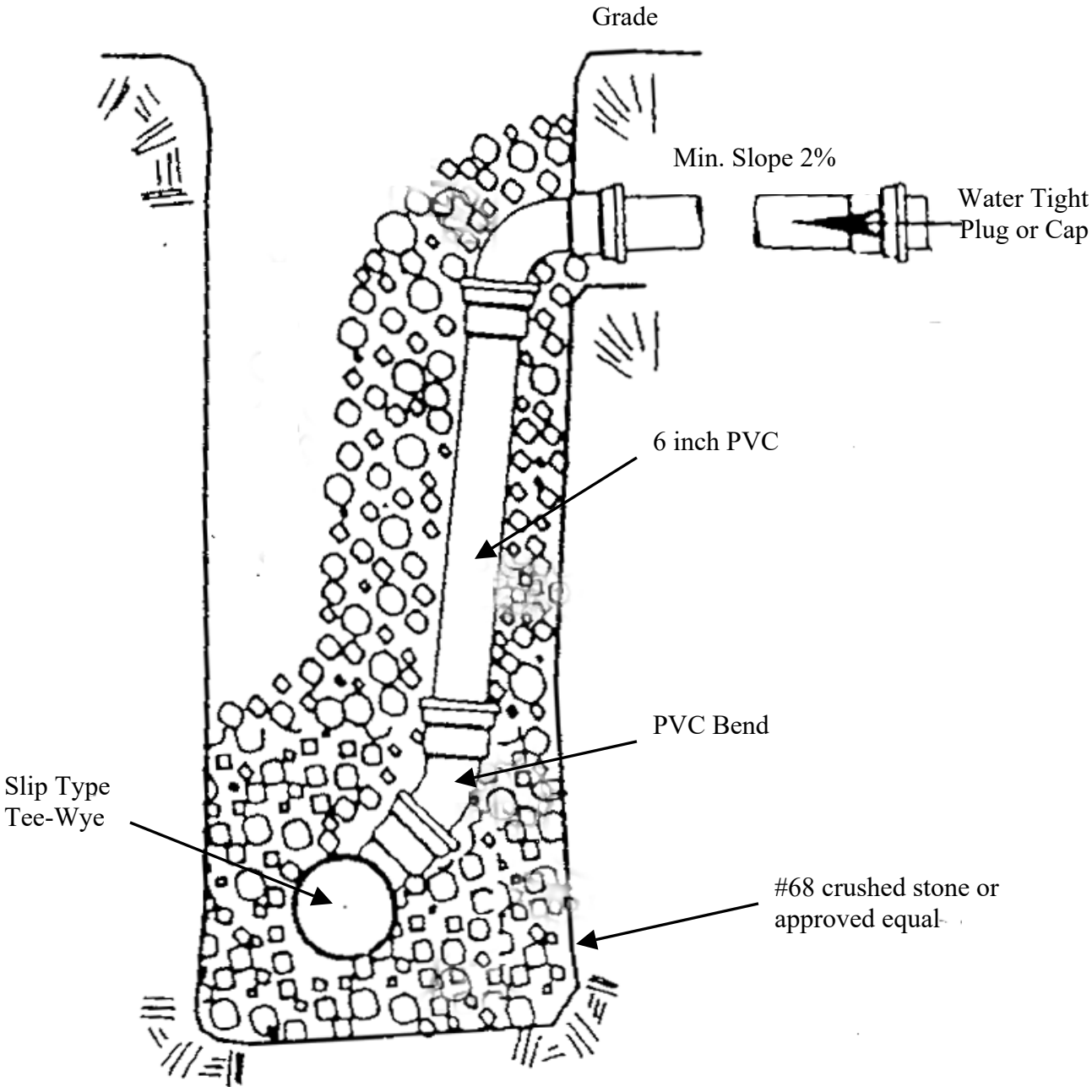


STANDARD DRAWINGS

LA GRANGE UTILITIES COMMISSION
412 E. Jefferson Street
LA GRANGE, KY. 40031

Date 3-1-2006

House Connection For Deep Sewer In Rock or Confined Location

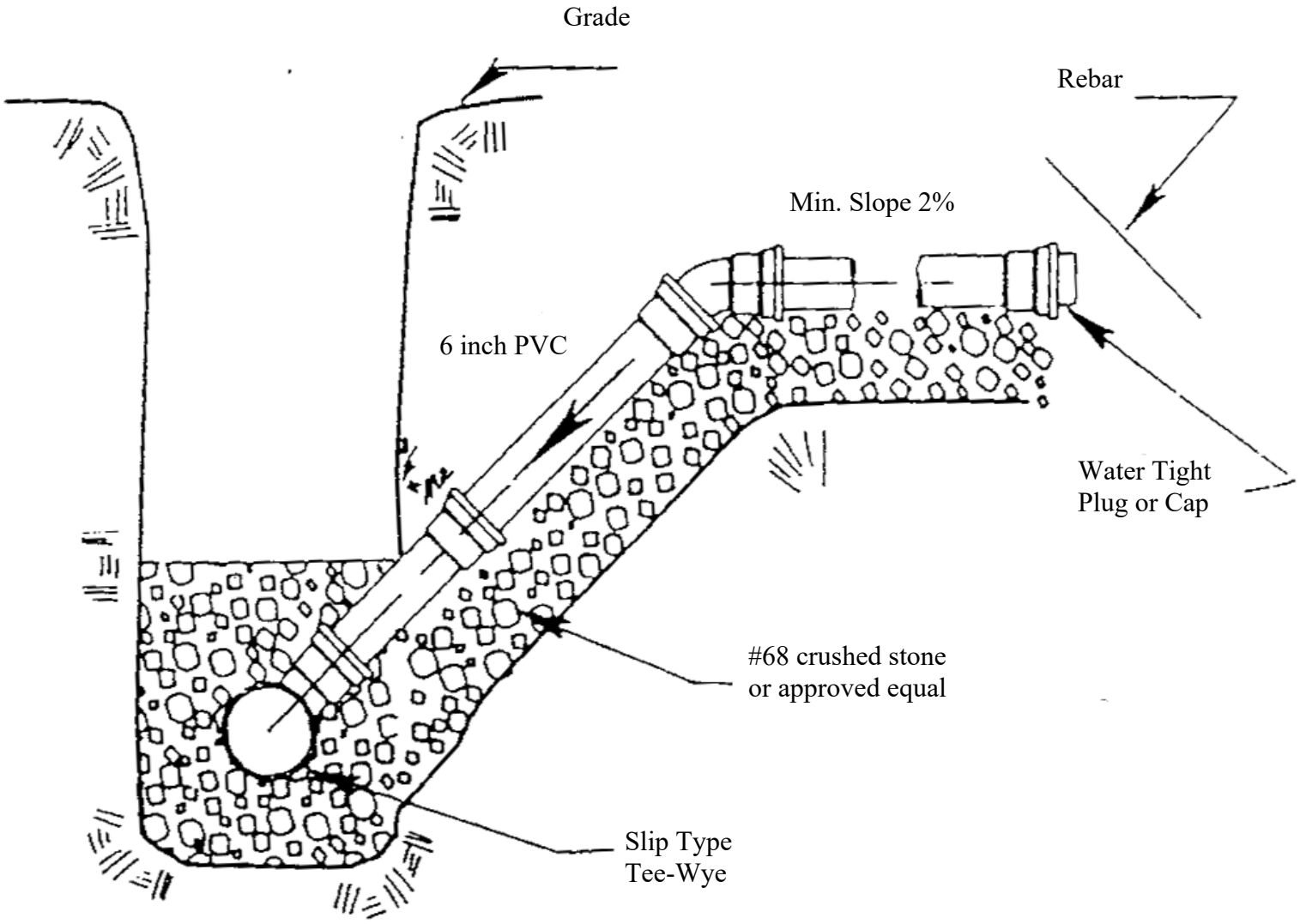


STANDARD DRAWINGS

LA GRANGE UTILITIES COMMISSION
412 E. Jefferson Street
LA GRANGE, KY. 40031

Date 3-1-2006

House Connection For Deep Sewer In Earth

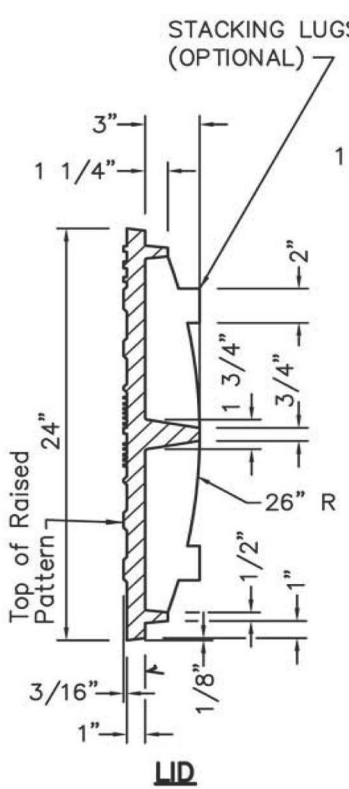


STANDARD DRAWINGS

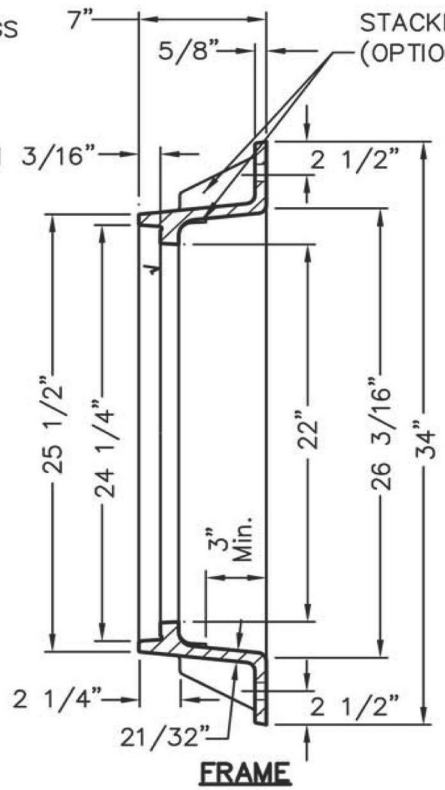
LA GRANGE UTILITIES COMMISSION
412 E. Jefferson Street
LA GRANGE, KY. 40031

Date 3-1-2006

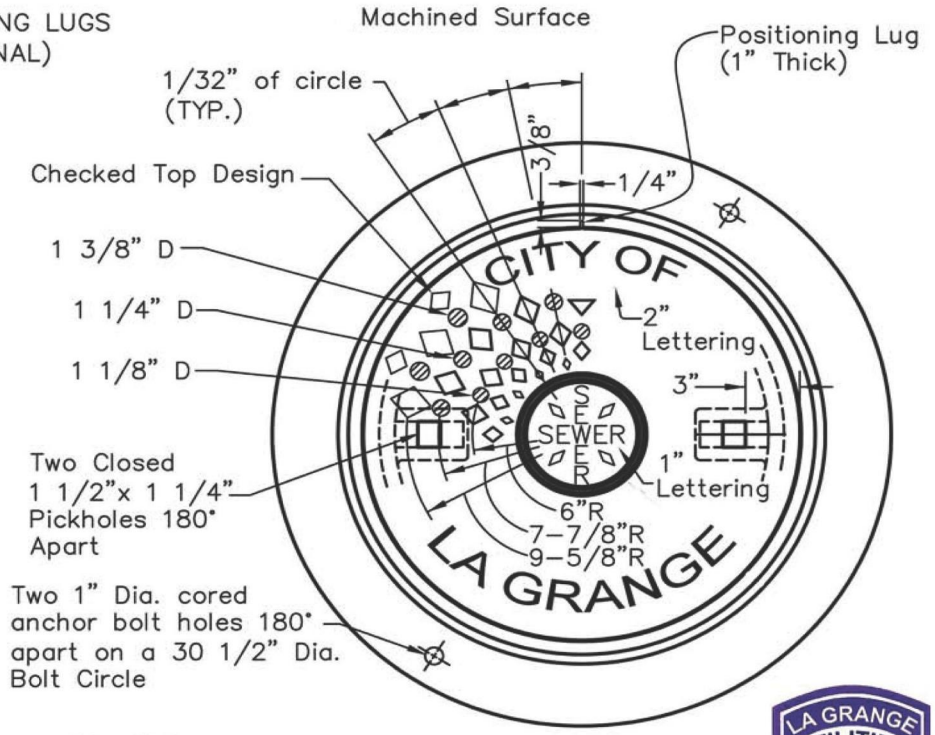
Standard La Grange Utilities Manhole Frame & Lid

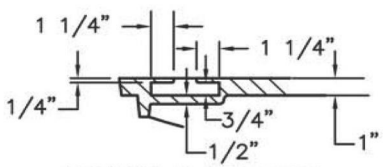


LID

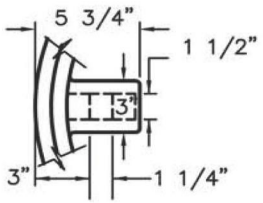


FRAME





PICKHOLE SECTION



PICKHOLE PLAN
(From Below)

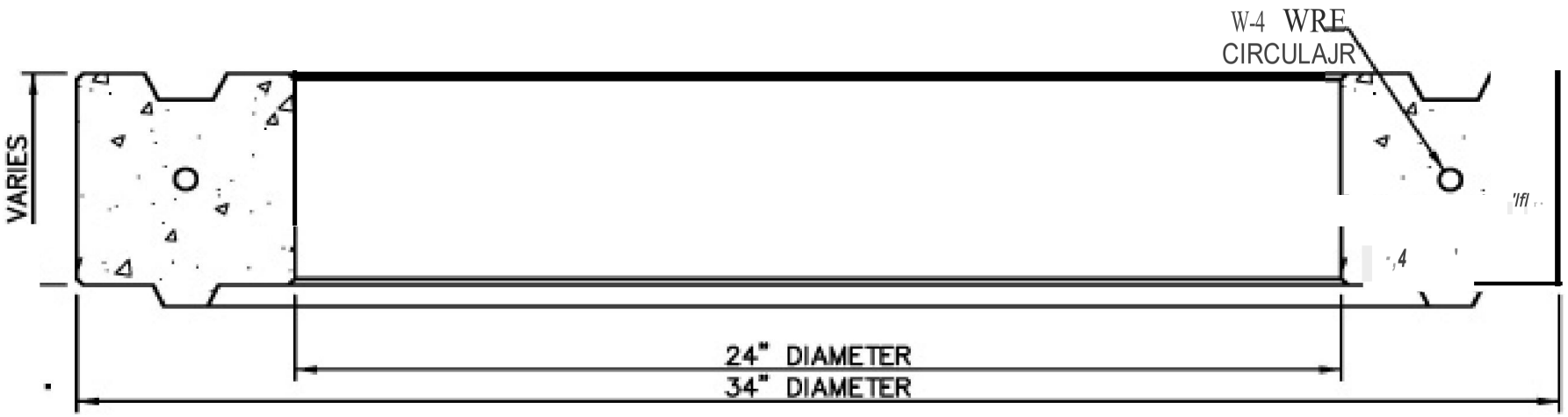
LA GRANGE UTILITIES COMMISSION NOTES:

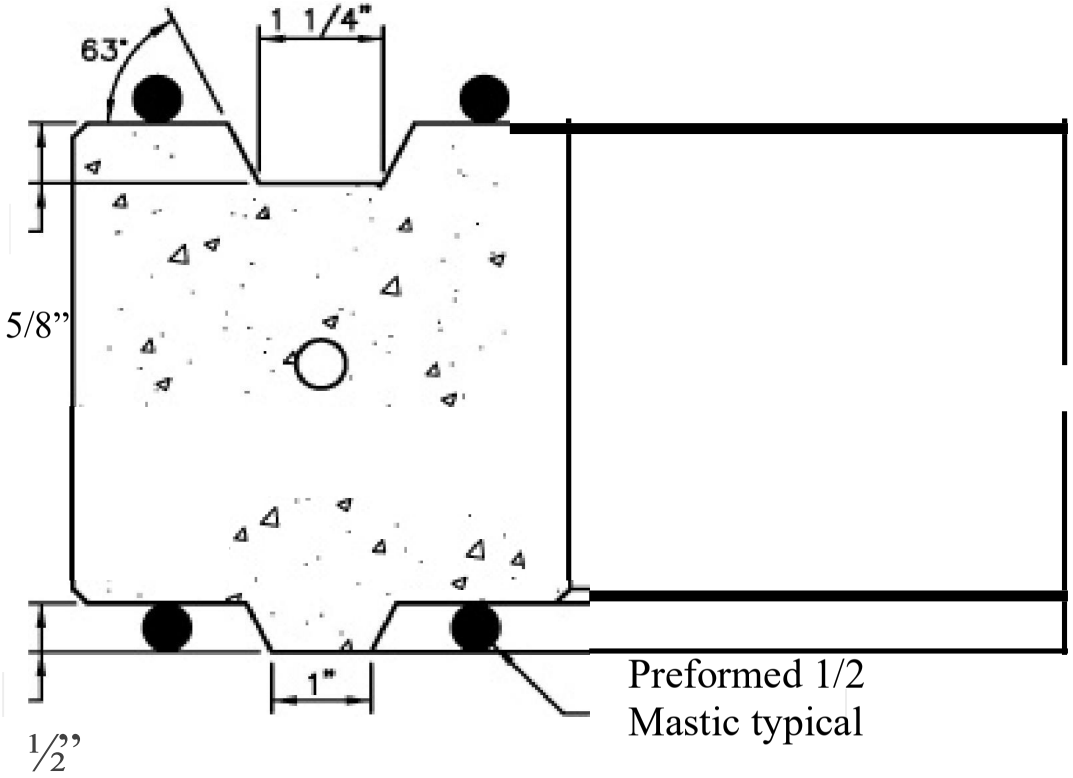
1. Minimum Weights: Frame = 174 lbs., Lid = 166lbs.
2. Design for H25 Loading
3. Material: Cast Gray Iron ASTM A-48, (Latest Revision) Class 35 – B

STANDARD DRAWINGS

LA GRANGE UTILITIES COMMISSION
203 South Walnut Street
LA GRANGE, KY. 40031

Date 9-1-2005





NOTES:

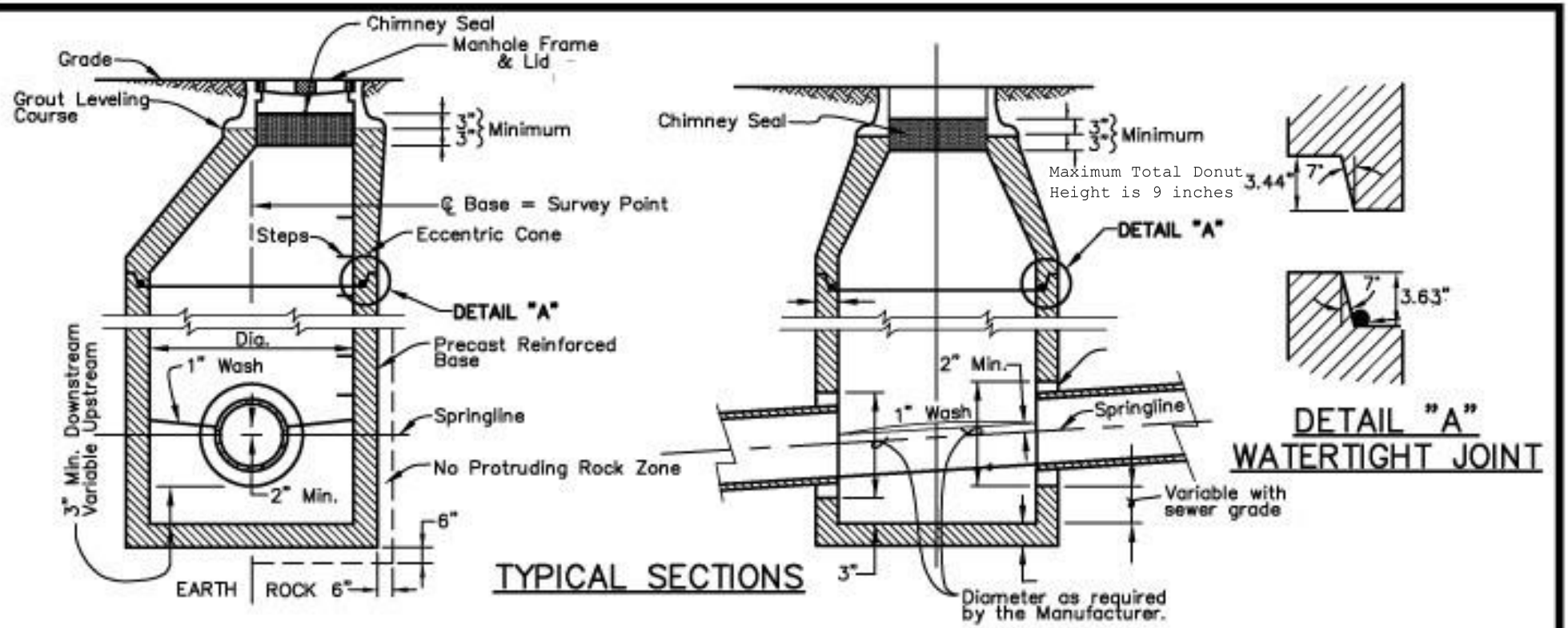
1. CONCRETE STRENGTH-4500 PSI @ 28 DAYS
2. REINFORCEMENT ASTM A-615 &ASTM A-615M (LATEST REVISION) **GRADE** 60
3. DESIGN LOAD -ASTM C478 & ASTM C478M (LATEST REVISION) ON MANHOLE ONLY.
4. COLLAR THICKNESS- 3", 4", 6", 9"
5. ALL EDGES HAVE A 3/16 x 45° CHAMFER.

STANDARD DRAWINGS

GRANGE UTILITIES COMMISSION

203 South W

La Grange Utilities Commission
Standard Manhole Type 1



Manhole inverts on 8" pipe shall have a min. constant grade of .9% unless any line exceeds 10%, at which time the variable grade note applies.

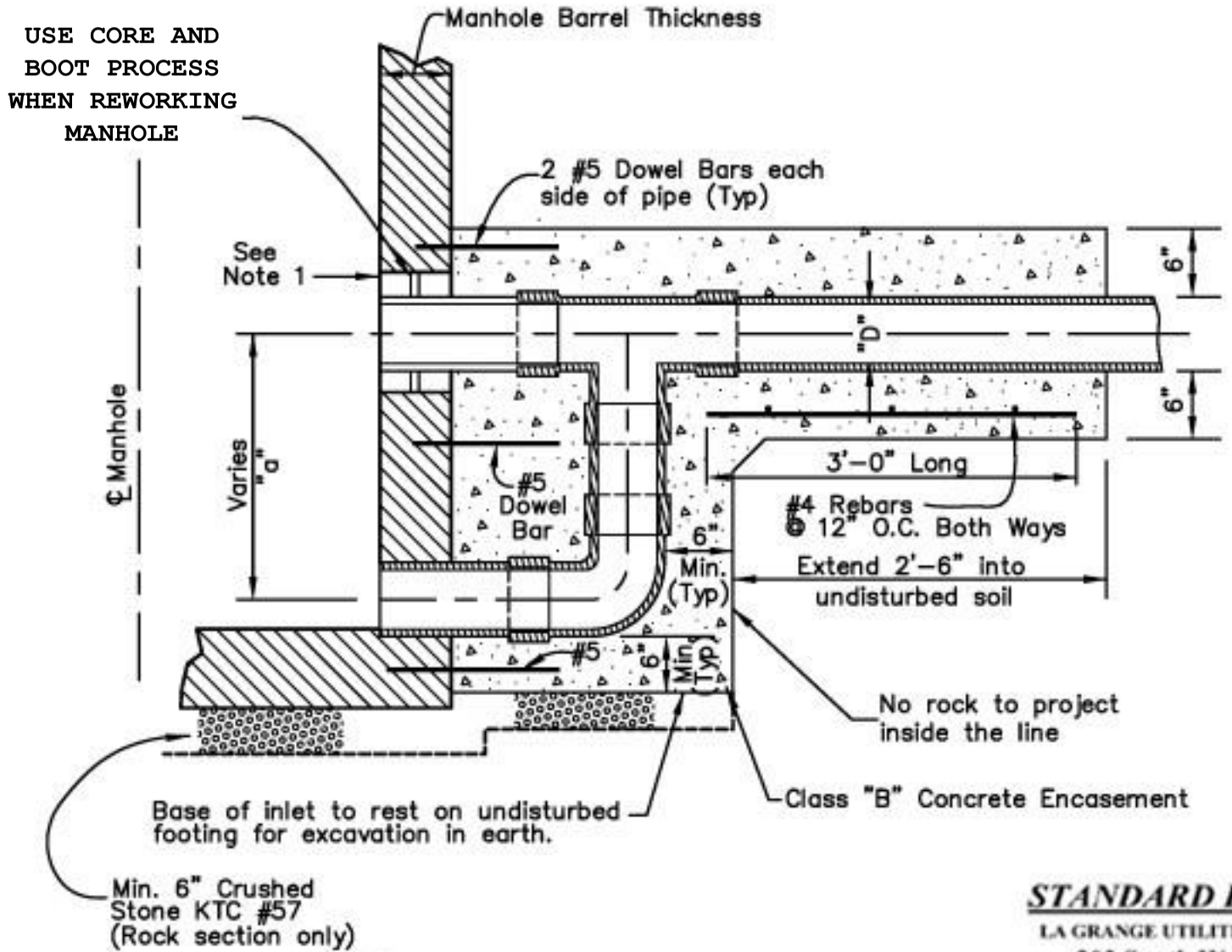
All new manholes must be precast. Manholes must be moved with approved lifting rings and spreader bar, any damage to manhole will result in rejection from La Grange Utilities.

Waterproofing: Waterproofing will be required to all manholes. 12" mastic wrap is required on the outside of all joints (clean and apply bonding agent per manf. Spec. before application).

Flexible connectors designed to produce a positive watertight connection for pipes entering precast manholes shall be provided. These connectors shall be the A-LOK produced by A-LOK Products, Inc. or approved equal such as a boot held with a stainless-steel band and two stainless steel bands around the pipe.

Interior coating: Where manholes are subject to excessive hydrogen sulfide exposure, the City requires manholes be lined with a one-part urethane Tnemec Series 434 Perma-Shield H2S or equal. Interior coating shall be applied prior to delivery to the site and touched up.

P.V.C. Vertical Drop Inlet



P.V.C. DROP INLET CHART

Minimum Dimensions ℄ to ℄ "a"	"D" I.D. of Pipe & Drop Inlet
16"	4"
20"	6"
24"	8"
26"	9"
27"	10"
31"	12"
37"	15"
47"	18"
51"	21"
64"	24"
73"	27"

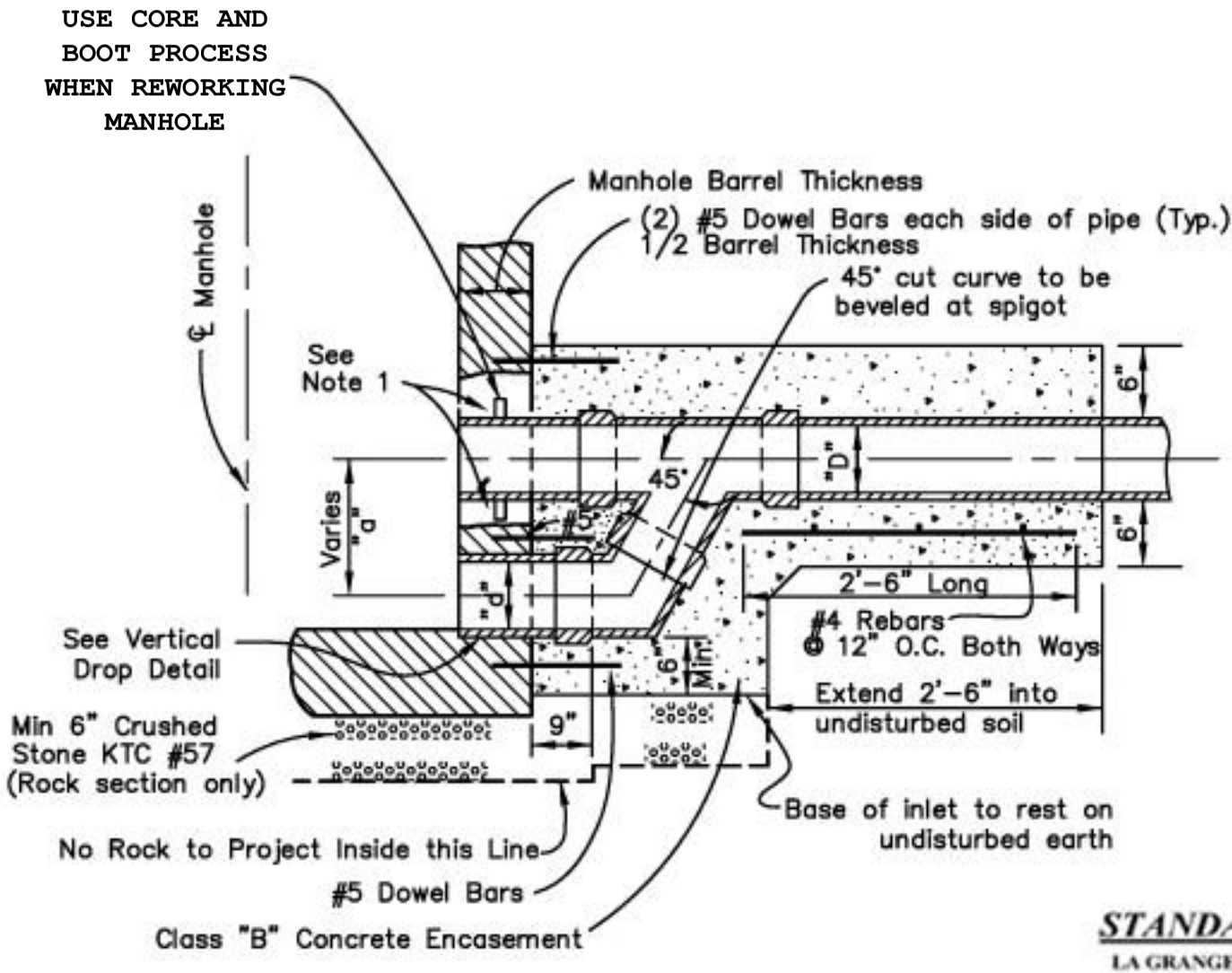
NOTE

1. Sewer Pipe Connection to precast manhole with Positive Seal Gasketing System(A.S.T.M. C–923) Gasket shall be as manufactured by the Press Seal Gasket Co., A–Lok or Kor–N–Seal manhole pipe connectors or approved equal for sanitary sewers.

STANDARD DRAWINGS
LA GRANGE UTILITIES COMMISSION
203 South Walnut Street
LA GRANGE, KY. 40031

3-1-2006

P.V.C. Slanting Drop Inlet



P.V.C. DROP INLET CHART

Minimum Dimensions ℄ to ℄ "a"	"D" I.D. of Pipe & Drop Inlet
16"	4"
20"	6"
24"	8"
26"	9"
27"	10"
31"	12"
37"	15"
47"	18"
51"	21"
64"	24"
73"	27"

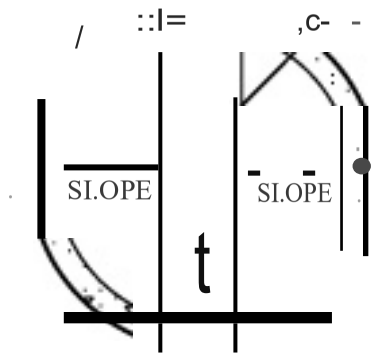
NOTE:

1. Sewer pipe connection to precast manhole with Positive Seal Gasketing System(A.S.T.M. C-923). Gasket shall be as manufactured A-lok or Kor-N-Seal Manhole pipe connectors or approved equal for sanitary sewers

STANDARD DRAWINGS

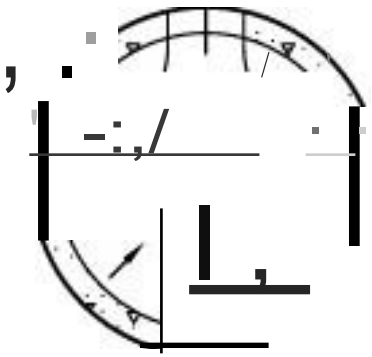
LA GRANGE UTILITIES COMMISSION
203 South Walnut Street
LA GRANGE, KY. 40031

3-1-2006

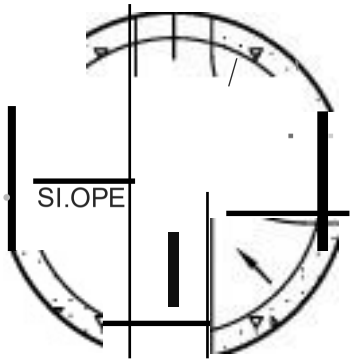


TYPICAL STRAIGHT FLOW

TYPICAL CURVE FLOW



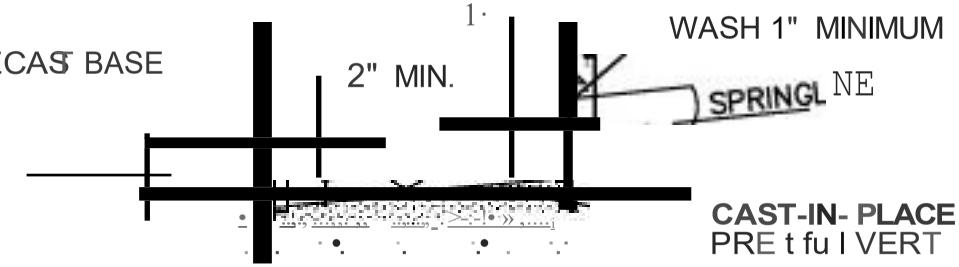
TYPICAL **4-WAY** FLOW



TYPICAL **3-WAY** FLOW

MINIMUM DISTANCE BETWEEN
OPENING FOR PIPE

TYPICAL CHANNELIZATION DETAILS FOR SANITARY SEWERS



TYPICAL CROSS SECTION

STANDARD DRAWINGS

LAGRANGE UTILITIES COMISSION
412 E. Jeffserson Street
LA GRANGE, KY. 40031

Date 9-1-2005

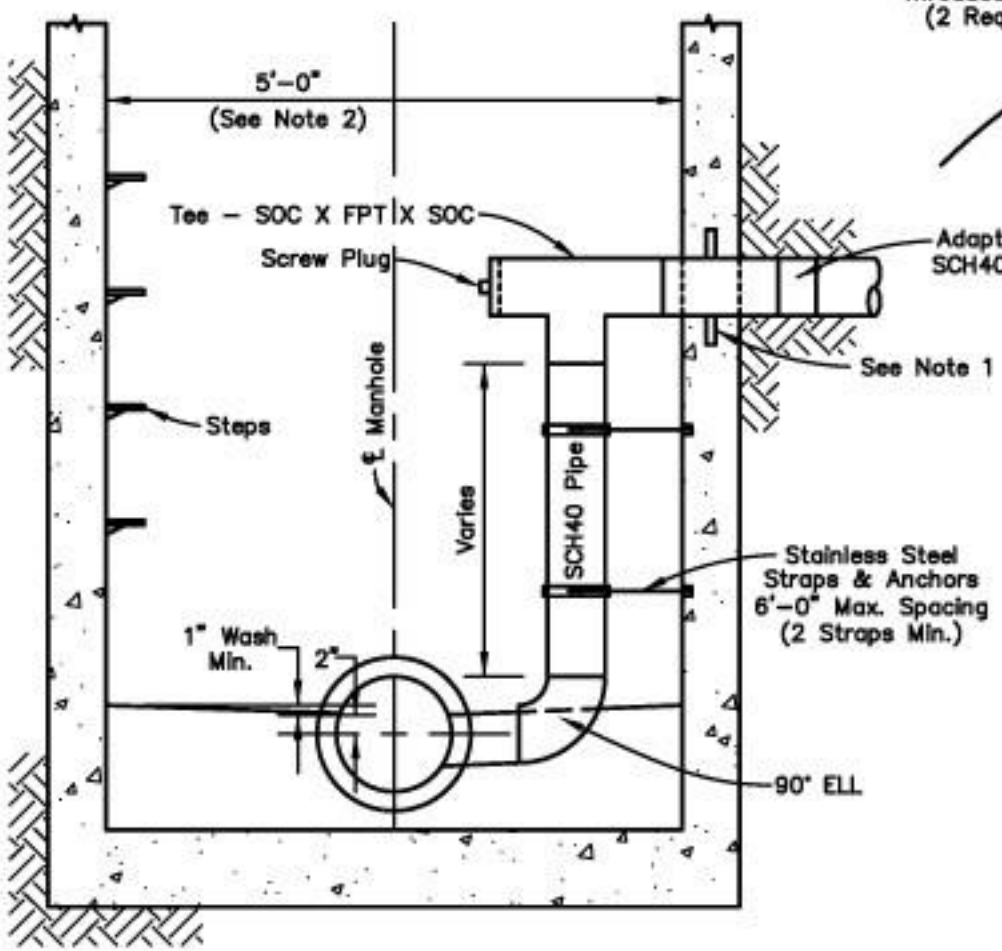
Force Main into Manhole Detail

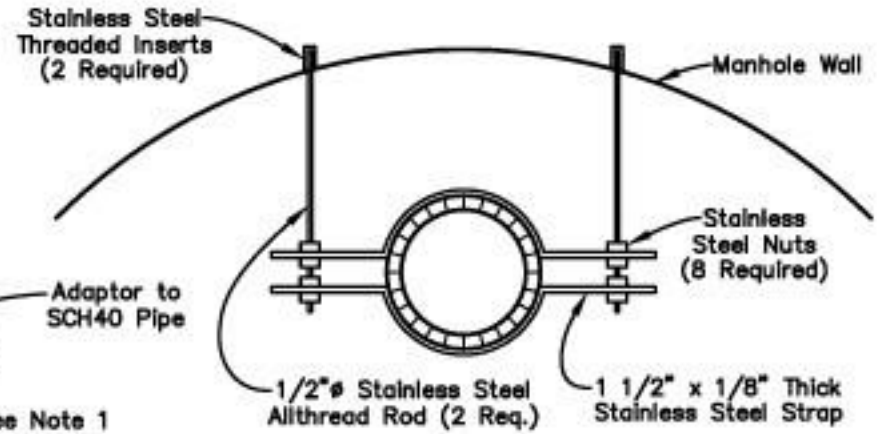
3-1-2006

NOTES:

1. Sewer pipe connection to precast manhole with Positive Seal Gasketing System (A.S.T.M. C–923). Gasket shall be as manufactured by A–lok or Kor–N–Seal Manhole gasket pipe connectors or approved equal for sanitary sewers.

2. The minimum diameter will be 5'–0" for a 2–inch thru 6–inch sewer. For pipe sizes greater than 6–inches, the manhole diameter will need to be approved by MSD.





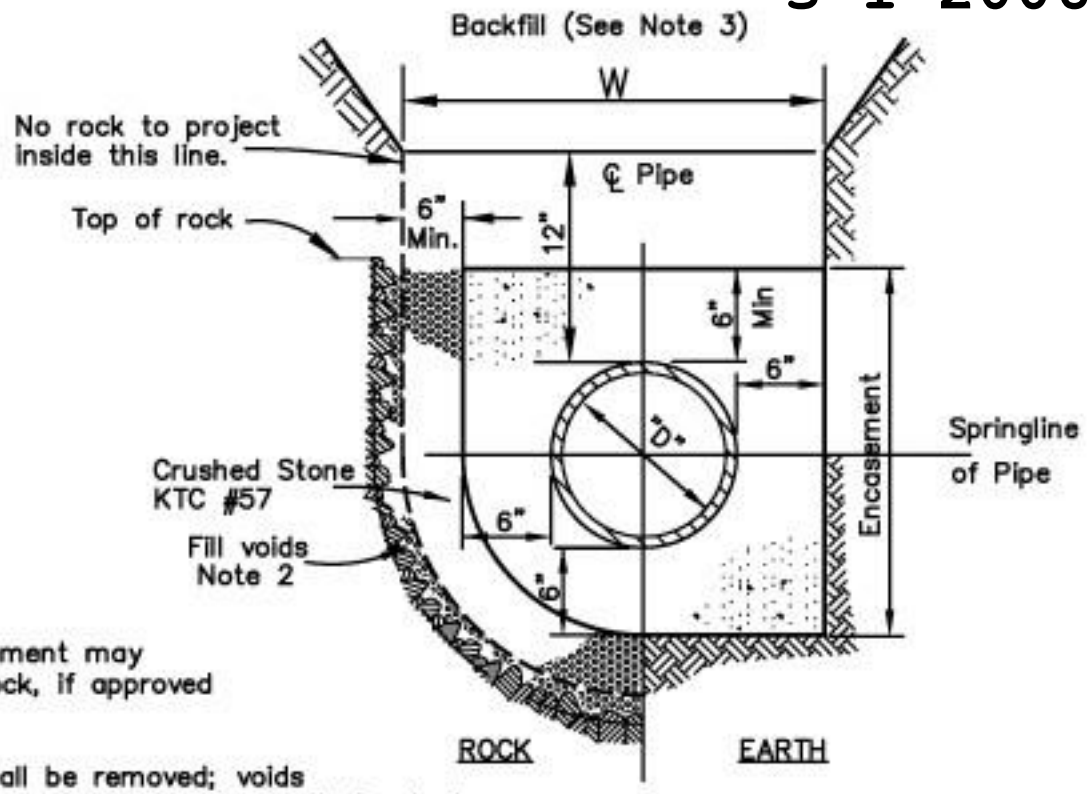
STANDARD DRAWINGS

LA GRANGE UTILITIES COMMISSION
203 South Walnut Street
LA GRANGE, KY. 40031

CONCRETE ENCASEMENT

3-1-2006

Maximum Allowable Trench Width 12" Above Outside Top of Pipe "W"	Inside Diameter of Pipe "D"
2'-6"	4"
2'-8"	6"
2'-10"	8"
3'-0"	10"
3'-5"	12"
3'-9"	15"
4'-1"	18"
4'-4"	21"
4'-8"	24"
5'-1"	27"
5'-5"	30"
5'-10"	33"
6'-2"	36"
6'-8"	39"
6'-11"	42"
7'-6"	48"
D+2t+ 2'-8"	over 48"



NOTES:

1. The concrete encasement may be placed against rock, if approved by the engineer.
2. All rock loosened shall be removed; voids created by such removal shall be filled with Crushed Stone KTC #57.
3. Backfill shall be as noted on the drawings.
4. Contractor shall encase pipe a minimum of 6-inches above the pipe or to existing rock line, as shown on drawings.
5. Contractor shall keep pipe from floating during the placement of concrete.
6. If concrete is placed against sheeting, tarred or other suitable paper shall be first attached to the sheeting. The sheeting will not be allowed to be removed until the concrete has sufficiently cured.
7. Class "B" concrete shall be used.

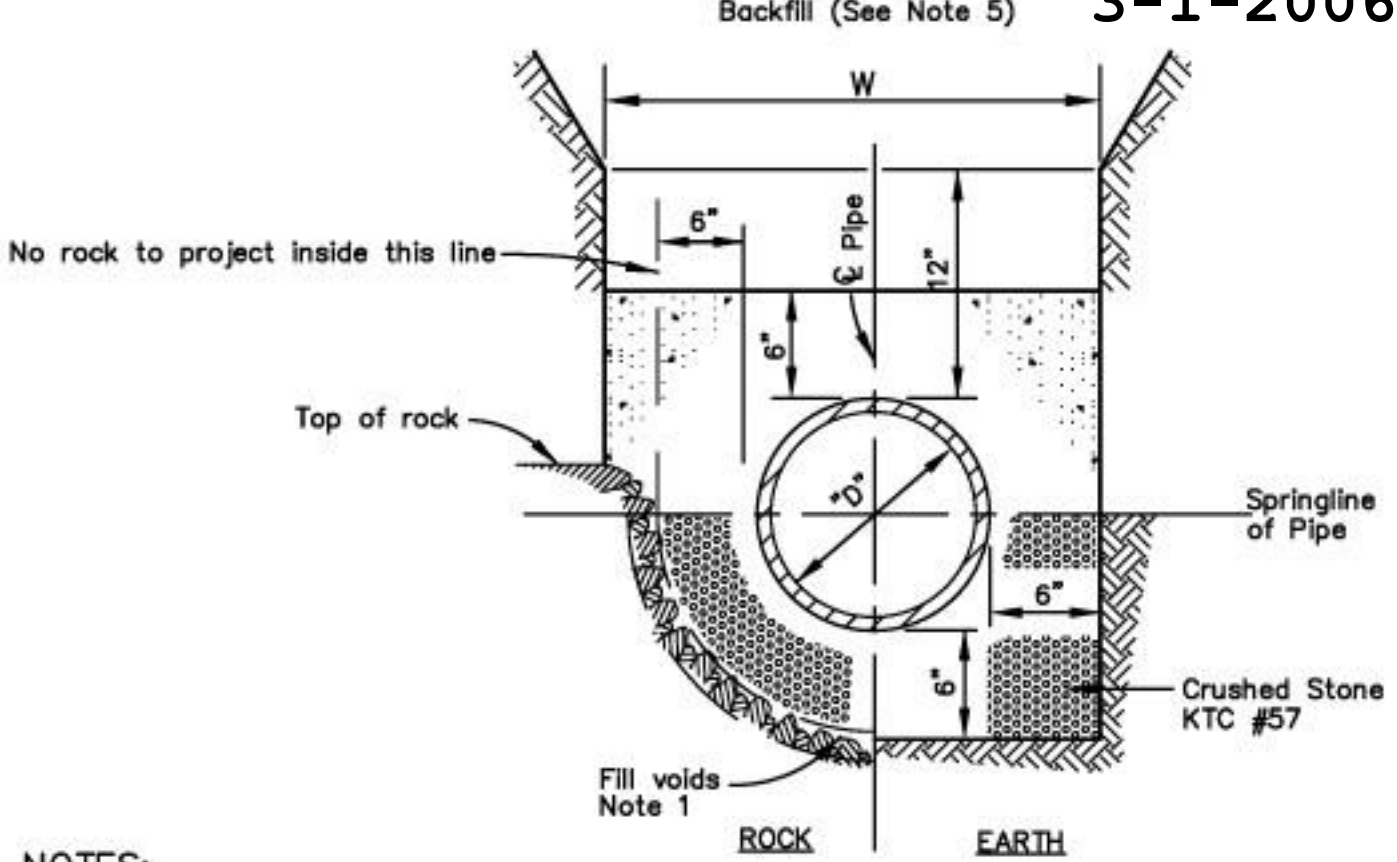
STANDARD DRAWINGS
LA GRANGE UTILITIES COMMISSION
203 South Walnut Street
LA GRANGE, KY. 40031

CONCRETE CAP

3-1-2006

Maximum Allowable Trench Width 12" Above Outside Top of Pipe "W"	Inside Diameter of Pipe "D"
2'-6"	4"
2'-8"	6"
2'-10"	8"
3'-0"	10"
3'-5"	12"
3'-9"	15"
4'-1"	18"
4'-4"	21"
4'-8"	24"
5'-1"	27"
5'-5"	30"
5'-10"	33"
6'-2"	36"
6'-8"	39"
6'-11"	42"
7'-6"	48"
D+2t+ 2'-8"	over 48"

If "W" is exceeded, a Concrete Cradle shall be placed at such locations at the Contractor's expense. Applies to excavations in rock or earth.



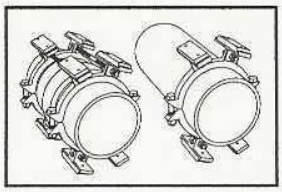
NOTES:

1. All rock loosened shall be removed; voids created by such removal shall be refilled with Crushed Stone KTC #57.
2. If concrete is placed against sheeting, tarred or other suitable paper shall be first attached to the sheeting. The sheeting will not be allowed to be removed until the concrete has sufficiently cured.
3. The concrete cap may be placed against rock, if approved by the engineer.
4. Class "B" concrete shall be used.
5. Backfill shall be as noted on the drawing.
6. Remove stone for pipe bells to provide full contact of bedding.

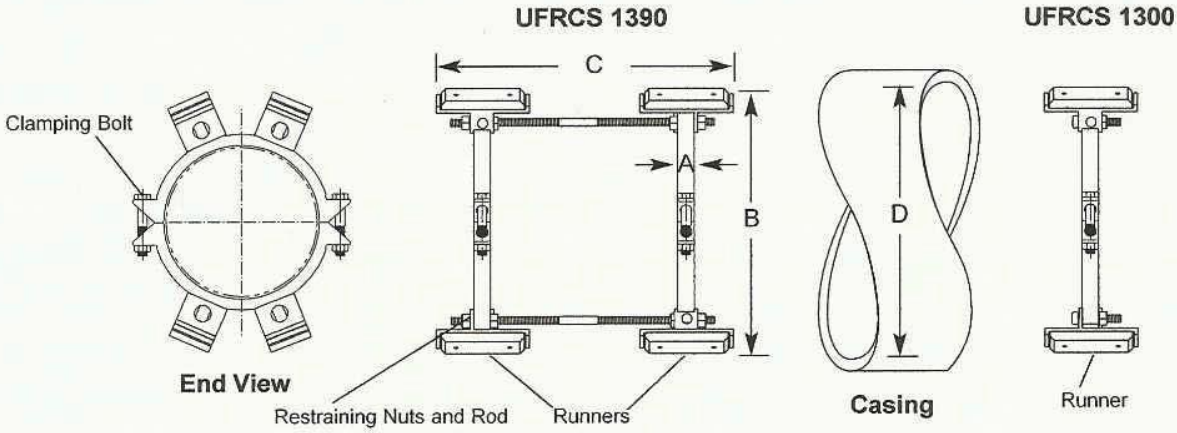
STANDARD DRAWINGS
LA GRANGE UTILITIES COMMISSION
203 South Walnut Street
LA GRANGE, KY. 40031

SUBMITTAL INFORMATION

Uni-Flange Series Casing Spacers 10" - 12" UFRCS



CASING SPACERS FOR SUPPORT OF 10" AND 12" PIPE BARREL AND PIPE BELL JOINT



RESTRAINED CASING SPACER FOR PIPE BELL JOINT - UFRCS1390

Nom. Pipe Size	Actual Pipe O.D.	Catalog Number	Approx. Shipping Weight	A	B (Approx.)	C (Approx.)	D Min. Casing Size (ID)	Runner Qty.	✓ Submitted Items
10"	11.10"	UFRCS1390-C-10	69.8	1-3/8"	19-3/4"	16"	21.5"	8	
12"	13.20"	UFRCS1390-C-12	75.8	1-3/8"	21-7/8"	18"	23"	8	

CASING SPACER FOR SUPPORT OF PIPE BARREL - UFRCS1300

Nom. Pipe Size	Actual Pipe O.D.	Catalog Number	Approx. Shipping Weight	A	B (Approx.)	C (Approx.)	D Min. Casing Size (ID)	Runner Qty.	✓ Submitted Items
10"	11.10"	UFRCS1300-C-10	33.1	1-3/8"	19-3/4"	N/A	21.5"	4	
12"	13.20"	UFRCS1300-C-12	36.1	1-3/8"	21-7/8"	N/A	23"	4	

FEATURES

- High strength ductile iron, ASTM A536, 65,000 psi tensile strength, 45,000 psi yield strength, 12% elongation capability. (Grade 65-45-12)
- Restraining Rods/Nuts: High Strength, Low Alloy ASTM A242, ANSI/AWWA C111/A21.11
- Clamping Bolts / Nuts: SAEJ 429, Grade 5
- Runners: Ultra high molecular weight polymer Tensile Impact 600-1200 ft. lbs. / in^2
  Coefficient of Friction .10 ASTM D-1894 Dielectric Constant 2.3 ASTM D-150
  Temperature Range -220 F. to +1800 F. continuous service
- 10" - 12" Sizes: Runners installed on tie rod ears.
- The UFRCS1390 provides joint restraint. The UFRCS1300 provides pipe support only.

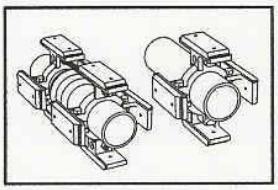
The Ford Meter Box Company considers the information in this submittal form to be correct at the time of publication. Item and option availability, including specifications, are subject to change without notice. Please verify that your product information is current.

The Ford Meter Box Company, Inc.
P.O. Box 443, Wabash, Indiana U.S.A. 46992-0443
Phone: 260-563-3171 / Fax: 800-826-3487
Overseas Fax: 260-563-0167
http://www.fordmeterbox.com 04/09/01

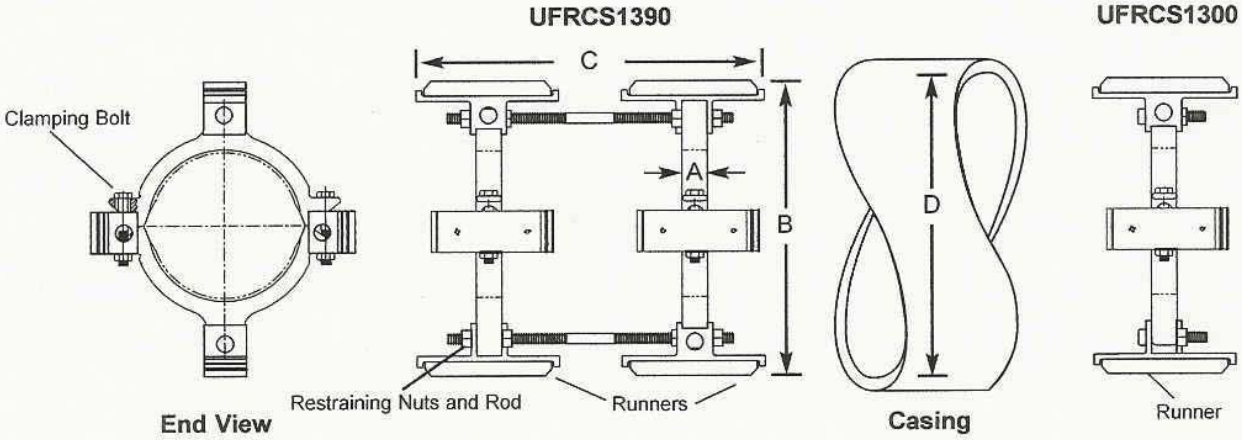
Submitted By:

SUBMITTAL INFORMATION

Uni-Flange Series Casing Spacers 4" - 8"UFRCS



CASING SPACERS FOR SUPPORT OF 4", 6" AND 8" PIPE BARREL AND PIPE BELL JOINT



RESTRAINED CASING SPACER FOR PIPE BELL JOINT - UFRCS1390

Nom. Pipe Size	Actual Pipe O.D.	Catalog Number	Approx. Shipping Weight	A	B (Approx.)	C (Approx.)	D Min. Casing Size (ID)	Runner Qty.	√ Submitted Items
4"	4.80"	UFRCS1390-C-4	31.7	1-1/8"	11-3/4"	12"	12.4"	8	
6"	6.90"	UFRCS1390-C-6	33.7	1-1/8"	13-3/8"	13"	13.6"	8	
8"	9.05"	UFRCS1390-C-8	44.9	1-1/8"	17-1/8"	15"	17.5"	8	

CASING SPACER FOR SUPPORT OF PIPE BARREL - UFRCS1300

Nom. Pipe Size	Actual Pipe O.D.	Catalog Number	Approx. Shipping Weight	A	B (Approx.)	C (Approx.)	D Min. Casing Size (ID)	Runner Qty.	√ Submitted Items
4"	4.80"	UFRCS1300-C-4	14.2	1-1/8"	11-3/4"	N/A	12.4"	4	
6"	6.90"	UFRCS1300-C-6	15.2	1-1/8"	13-3/8"	N/A	13.6"	4	
8"	9.05"	UFRCS1300-C-8	21.4	1-1/8"	17-1/8"	N/A	17.5"	4	

FEATURES

- High strength ductile iron, ASTM A536,65,000 psi tensile strength, 45000 psi yield strength, 12% elongation capability. (Grade 65-45-12)
- Restraining Rods/Nuts: High Strength, Low Alloy ASTM A242, ANSI/AWWA C111/A21.11
- Clamping Bolts / Nuts: SAEJ 429, Grade 5
- Runners: - Ultra high molecular weight polymer - Tensile Impact 600-1200 ft. lbs. / in^2
  - Coefficient of Friction .10 - ASTM D-1894 - Dielectric Constant 2.3 ASTM D- 150
  - Temperature Range -220 F. to +1800 F. continuous service
- 4" - 8" Sizes: Runners installed on tie rod ears and clamping bolt pads.
- The UFRCS1390 provides joint restraint. The UFRCS1300 provides pipe support only.

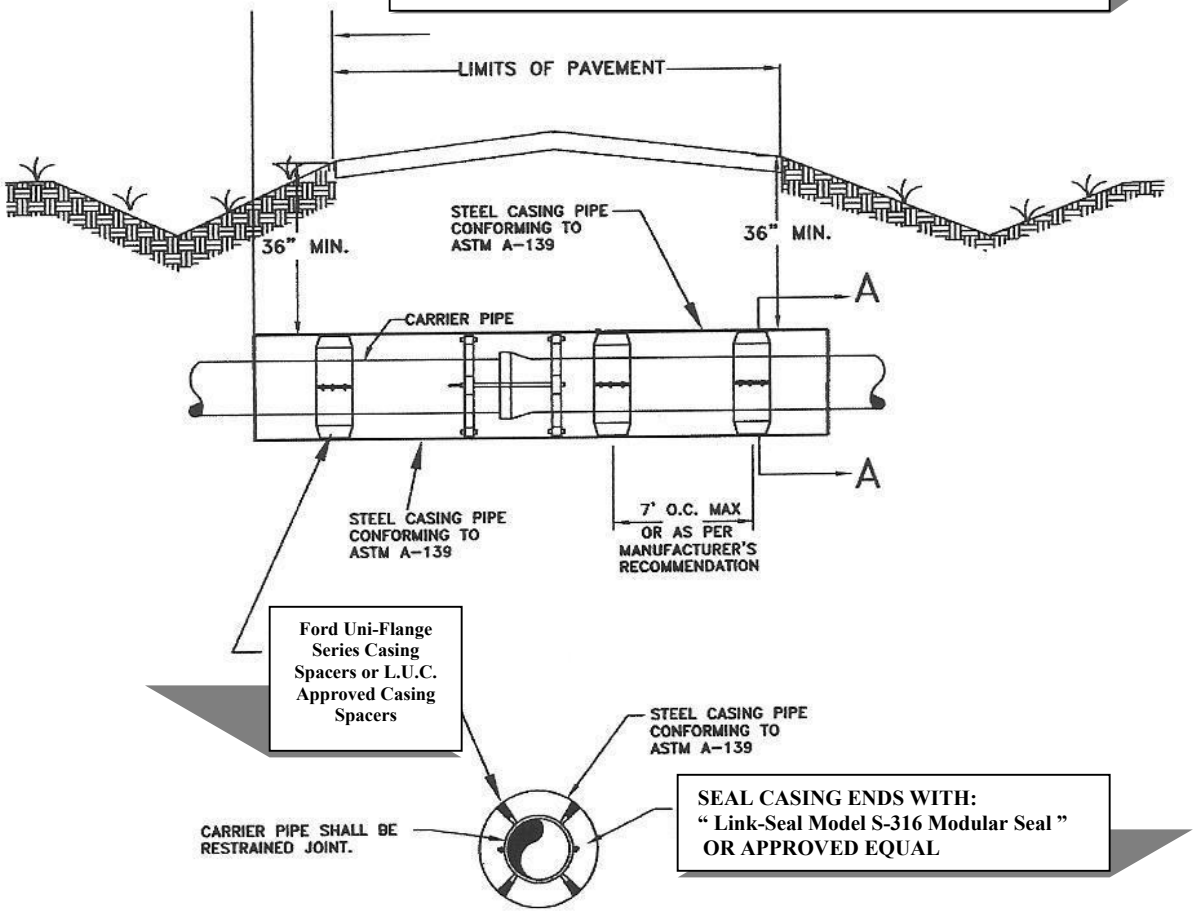
The Ford Meter Box Company considers the information in this submittal form to be correct at the time of publication. Item and option availability, including specifications, are subject to change without notice. Please verify that your product information is current.

The Ford Meter Box Company, Inc.
P.O. Box 443, Wabash, Indiana U.S.A. 46992-0443
Phone: 260-563-3171 / Fax: 800-826-3487
Overseas Fax: 260-563-0167
http://www.fordmeterbox.com 10/30/00

Submitted By:

Casing & Boring Detail

EXTEND CASING BEYOND EDGE OF PAVEMENT AND / OR CURB. CASING MUST BE INSTALLED IN ACCORDANCE WITH LA GRANGE PUBLIC WORKS AND / OR KY DEPARTMENT OF TRANSPORATION REQUIREMENTS.



SECTION "A-A"

STANDARD DRAWINGS

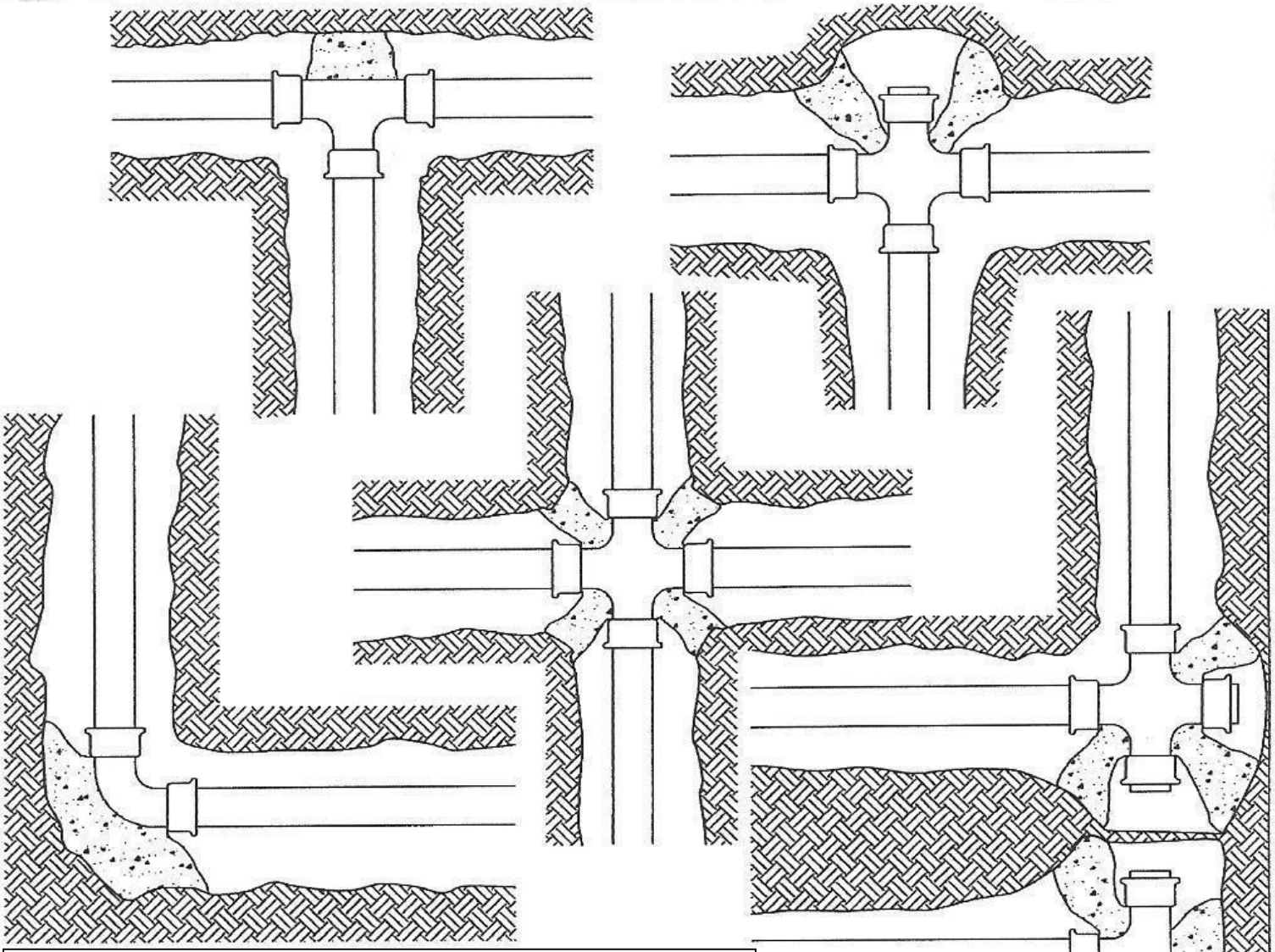
LA GRANGE UTILITIES COMMISSION

412 E. Jefferson Street

LA GRANGE, KY. 40031

La Grange Utilities Commission
Concrete Blocking Details

03-2004



1. THRUST BLOCKS SHALL BE POURED AGAINST UNDISTURBED MATERIAL. WHERE TRENCH WALL HAS BEEN DISTURBED. EXCAVATE ALL LOOSE MATERIAL AND EXTEND THRUST BLOCK TO UNDISTURBED MATERIAL.

2. ON TEES AND BENDS EXTEND THRUST BLOCK LENGTH PLACE BOARD IN FRONT OF ALL PLUGS BEFORE POURING THRUST BLOCK. KEEP M.J. BELLS AND BOLTS FREE FROM CONCRETE BY WRAPING WITH 5 MIL PLASTIC LINER & TAPEING ENDS.

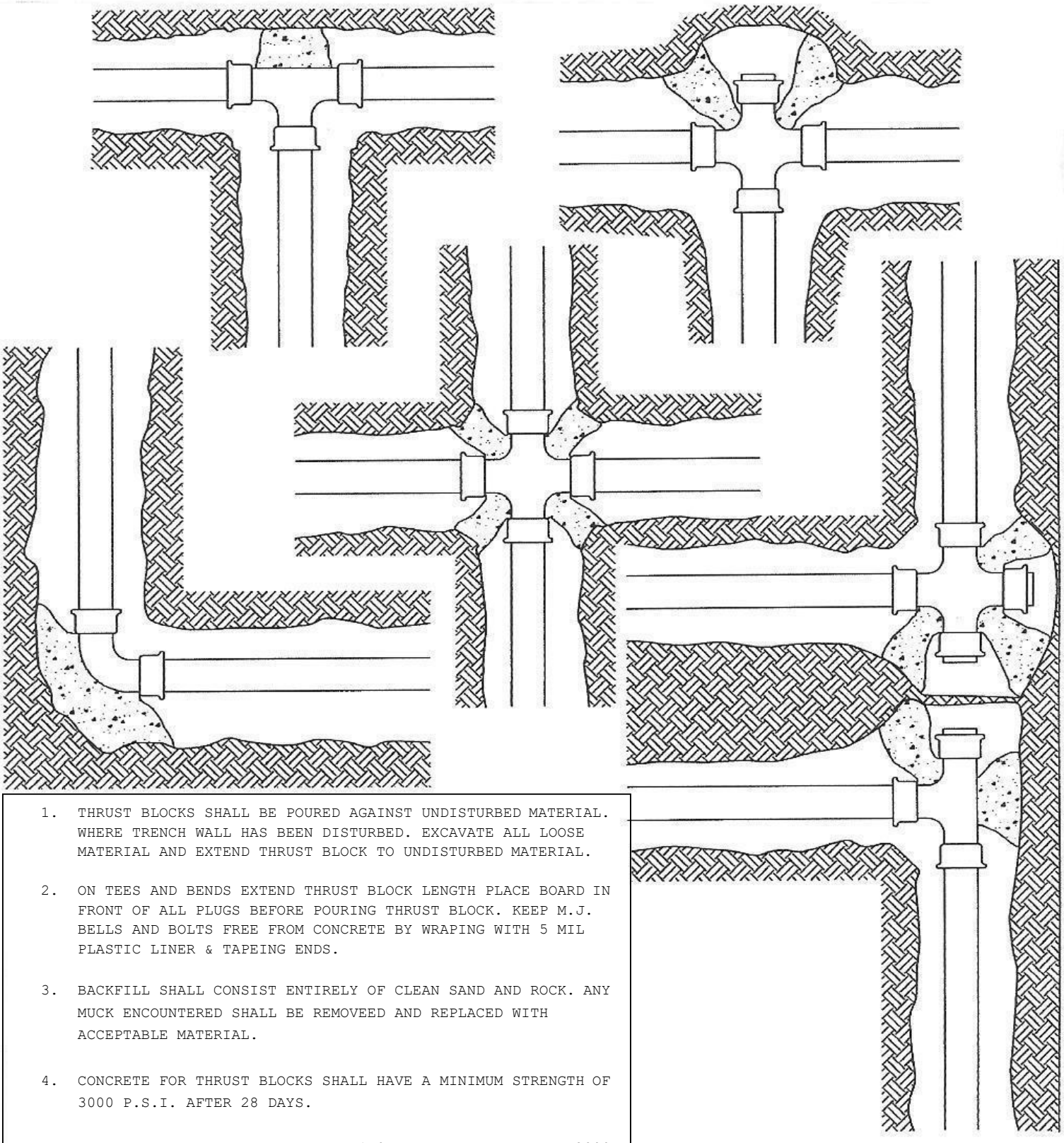
3. BACKFILL SHALL CONSIST ENTIRELY OF CLEAN SAND AND ROCK. ANY MUCK ENCOUNTERED SHALL BE REMOVEED AND REPLACED WITH ACCEPTABLE MATERIAL.

4. CONCRETE FOR THRUST BLOCKS SHALL HAVE A MINIMUM STRENGTH OF 3000 P.S.I. AFTER 28 DAYS.

5. THRUST BLOCK SITES COMPUTED AT 150 P.S.I. PRESSURE AND 2000 P.S.F SOIL BEARING CAPACITY.

La Grange Utilities Commission
Concrete Blocking Details

03-2004



1. THRUST BLOCKS SHALL BE POURED AGAINST UNDISTURBED MATERIAL. WHERE TRENCH WALL HAS BEEN DISTURBED. EXCAVATE ALL LOOSE MATERIAL AND EXTEND THRUST BLOCK TO UNDISTURBED MATERIAL.

2. ON TEES AND BENDS EXTEND THRUST BLOCK LENGTH PLACE BOARD IN FRONT OF ALL PLUGS BEFORE POURING THRUST BLOCK. KEEP M.J. BELLS AND BOLTS FREE FROM CONCRETE BY WRAPING WITH 5 MIL PLASTIC LINER & TAPEING ENDS.

3. BACKFILL SHALL CONSIST ENTIRELY OF CLEAN SAND AND ROCK. ANY MUCK ENCOUNTERED SHALL BE REMOVEED AND REPLACED WITH ACCEPTABLE MATERIAL.

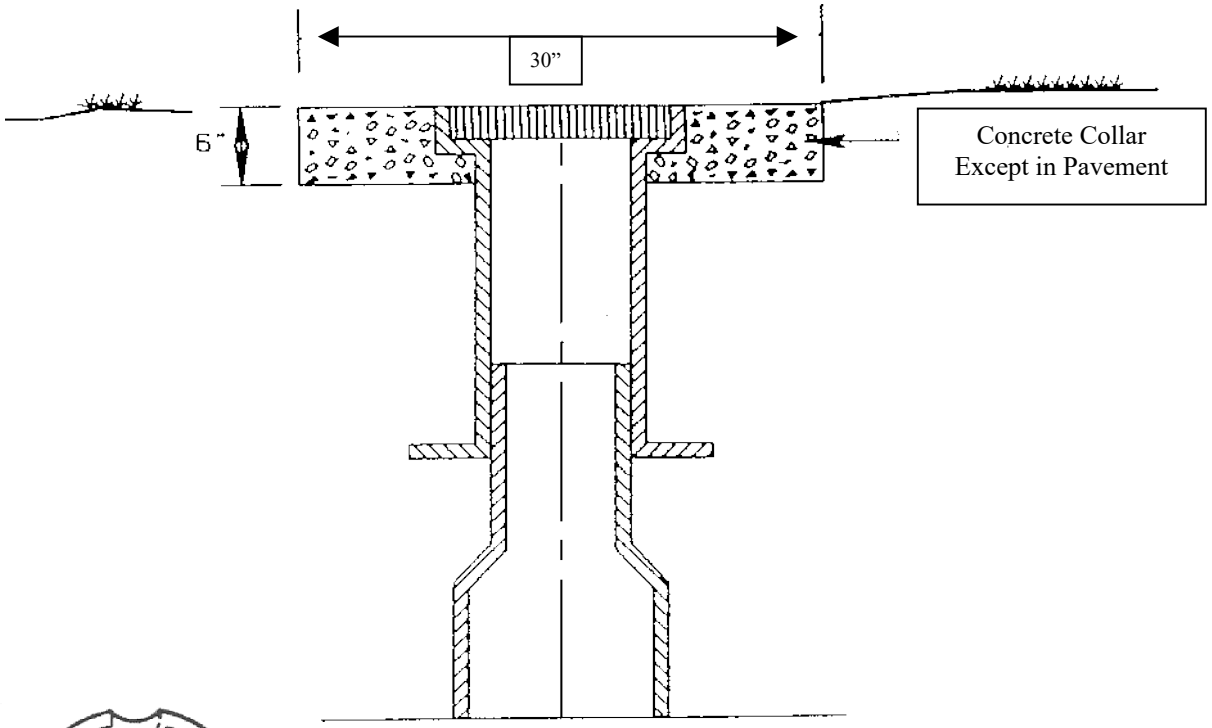
4. CONCRETE FOR THRUST BLOCKS SHALL HAVE A MINIMUM STRENGTH OF 3000 P.S.I. AFTER 28 DAYS.

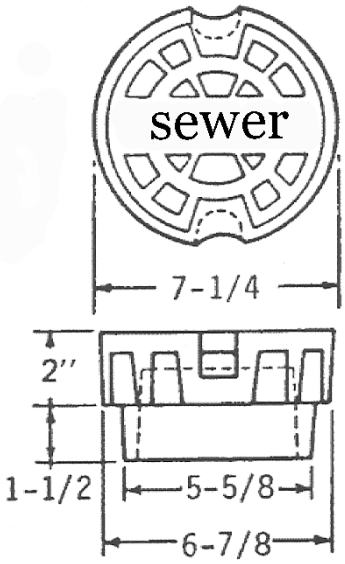
5. THRUST BLOCK SITES COMPUTED AT 150 P.S.I. PRESSURE AND 2000 P.S.F SOIL BEARING CAPACITY.

6. All mechanical joint fittings are required to have grip rings.

Cast Iron Screw Type Valve Box With Cast Iron Cap

30" SQ. X 6" Thick Concrete Pad
Surrounding Box, Min. 3,000 P.S.I.
Poured In Place.





STANDARD DRAWINGS

LA GRANGE UTILITIES COMMISSION

412 E. Jefferson Street

LA GRANGE, KY. 40031

Date 3-1-2006

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Bidding and Contract Requirements

Technical Specifications

****

DIVISION 01

GENERAL REQUIREMENTS

SECTION 012213 – BASIS OF MEASUREMENT AND PAYMENT - WATER

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. The Contractor shall furnish all necessary labor, machinery, tools, apparatus, equipment, materials, service and other necessary supplies and perform all Work shown on the Drawings and/or described in the Specifications and Contract Documents at the unit prices as indicated by the Bidder in the Bid.

B. The Bidder declares that he has examined the site of the Work and informed himself fully in regard to all conditions pertaining to the place where the Work is to be done; that he has examined the Plans, Specification and Contract Documents for the Work, and has read all special provisions furnished prior to the opening of bids; and that he has further satisfied himself relative to the Work to be performed. The Bidder further declares that he understands that unit quantities shown in the Proposal are approximately only, are subject to increase or decrease, and that, should the quantities of any of the items be decreased, the Bidder will make no claim for the anticipated profits. In addition, the Owner also reserves the right to adjust quantities, either by addition or deletion and as-BID unit price shall remain in effect for these quantity adjustments.

C. All excavation required of the work shall be done as part of the total price for the complete project. All excavation shall be unclassified.

1.2 PAY ITEMS

A. The items listed hereinafter refer to and are the same items listed in the PROPOSAL hereinbefore and constitute all of the pay items in this Contract. Any other items of Work listed in the Specifications or shown on the Drawings shall be considered incidental to the above items.

1.3 WATER PIPE

A. Payment for water pipe shall be as described in the KYTC Standardized Water Bid Descriptions: Section 012213.10.

B. Installation of concrete thrust block shall be included as part of this pay item and considered incidental to the installation of the water pipe.

1.4 WATER VALVES

A. Payment for water valves shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10

1.5 WATER VALVES SPECIAL (INSERTING VALVES AND BOXES)

A. Payment for furnishing and installing inserting valves and boxes will be made at their respective contract unit price each, complete in place, which price includes compensation for furnishing and delivering all equipment and machinery to install insertion valve, excavation (including rock), exposing existing water main, installing tapping saddle and tapping cartridge on existing main, blocking, drilling and tapping existing live water main, dewatering, installation of insertion valve, backfilling, surface restoration (include concrete and asphalt pavement replacement), and all other installation requirements necessary to complete the insertion valve.

1.6 WATER FIRE HYDRANT ASSEMBLY

A. Payment for water fire hydrant assembly shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.7 WATER FIRE HYDRANT REMOVE

A. Payment for water fire hydrant assembly shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.8 WATER CAP EXISTING WATER MAIN

A. Payment for capping existing water main shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.9 WATER TAPPING SLEEVE AND VALVE

A. Payment for connections to existing water mains using a tapping sleeve and valve shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.10 WATER TIE-IN

A. Payment for connection to existing water mains shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.11 WATER METER RELOCATE

A. Payment for relocation of an existing service meter shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.12 WATER ENCASEMENT STEEL BORED

A. Payment for steel encasement bore shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.13 WATER ENCASEMENT STEEL OPEN CUT

A. Payment for steel encasement open cut shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.14 RAILROAD COORDINATION

A. Payment for railroad coordination will be made at the respective contract unit price lump sum, which price shall include compensation for coordinating the railroad flagger and inspector. The Owner has previously obtained the Liability Insurance policy and executed an Agreement with the CSX Railroad. The Contractor shall be responsible for coordinating the previously executed permits, insurance, and agreements that have been made available and are on the project site. The Contractor shall include in his bid price the cost for providing the CSX Railroad flagger and CSX Inspector. Instructions can be found in the Railroad Permit; Section 330523.10.

1.15 WATER SERVICE LONG SIDE

A. Payment for customer service installation across the centerline of a public roadway shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.16 WATER SERVICE SHORT SIDE

A. Payment for customer service installation not crossing the centerline of a public roadway shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.17 WATER LINE MARKER

A. Payment for customer service installation not crossing the centerline of a public roadway shall be as described in the KYTC Standardized Water Bid Descriptions; Section 012213.10.

1.18 W STRUCTURE REMOVAL (EXISTING BOOSTER PUMP STATION)

A. Payment for removal of existing booster pump station (whole) and delivery to OCWD office will be made at the respective contract unit price lump sum, which price shall include compensation for the excavation (including rock), removal of the existing booster pump station (whole), capping existing influent and effluent lines of pump station, transportation of the booster pump station to OCWD office, backfilling, surface restoration, and all other requirements necessary to remove and transport the pump station.

1.19 SAFELOADING

A. Payment for safeloading existing watermains that will remain abandoned piping under highway shall be made at their respective contract unit price cubic yard, which price includes compensation for furnishing and delivering all equipment and material to safeload the piping, excavation (including rock), exposing existing water main, backfilling, surface restoration

(include concrete and asphalt pavement replacement), and all other installation requirements necessary to complete the safeloading.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 012213

Standard Water Bid Item Descriptions

W AIR RELEASE VALVE This bid item description shall apply to all air release valve installations of every size except those defined as "Special". This item shall include the air release valve, main to valve connecting line or piping, manhole, vault, structure, access casting or doors, tapping the main, labor, equipment, excavation, proper backfill and restoration required to install the air release valve at the location shown on the plans or as directed in accordance with the specifications and standard drawings complete and ready for use. All air release/vacuum valves on a project shall be paid under one bid item regardless of size. No separate pay items will be established for size variations. Only in the case of the uniqueness of a particular air release valve would a separate bid item be established. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

BOLLARDS This item is for payment for furnishing and installing protective guard posts at above ground utility installations. A bollard may consist of, but not limited to, a steel post set in concrete or any other substantial post material. This item shall include all labor, equipment, and materials needed for complete installation of the bollard as specified by the utility owner specifications and plans. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

NOTE: A bid code for this item has been established in standard roadway bid items and shall be used for payment of this item. The bid code is 21341ND

W CAP EXISTING MAIN This item shall include the specified cap, concrete blocking and/or mechanical anchoring, labor, equipment, excavation, backfill, and restoration required to install the cap at the location shown on the plans or as directed in accordance with the specifications. This item is not to be paid on new main installations. This pay item is only to be paid to cap existing mains. Caps on new mains are incidental to the new main. Any and all caps on existing mains shall be paid under one bid item included in the contract regardless of size. No separate bid items will be established for size variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W DIRECTIONAL BORE Payment under this item is made whenever the plans or specifications specifically show directional boring is to be utilized in order to minimize the impact of open cut for the installation of water main under streets, creeks, and etc. Payment under this item shall include the specified bore pipe, labor, and equipment. No separate payment shall be made for bore pipe installed in the bore whether used as a carrier pipe or an encasement of a separate carrier pipe. This item shall also include pipe anchors at each end of the bore when specified to prevent the creep or contraction of the bore pipe. Carrier pipe installed within a bore pipe shall be paid separately under pipe items. Payment under this item shall not be size specific and no separate bid items will be established for size variations. The bore pipe sizes to be included under this item shall be as shown on the plans and/or in the specifications. Any and all directional bores in each contract shall be paid under one directional bore bid item included in the contract regardless of size. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

W ENCASEMENT CONCRETE Includes all labor, equipment, excavation, concrete, reinforcing steel, backfill, restoration, and etc., to construct the concrete encasement of the water main as shown on the plans, and in accordance with the specifications and standard drawings. Payment under this item shall be in addition to the carrier pipe as paid under separate bid items. Carrier pipe is not included in this bid item. Any and all concrete encasement shall be paid under one bid item included in the contract regardless of the size of the carrier pipe or the volume of concrete or steel reinforcement as specified in the plans and specifications. No separate bid items will be established for size variations. Measurement of pay quantity shall be from end of concrete to end of concrete. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

W ENCASEMENT STEEL BORED This item shall include the steel encasement pipe size as specified on the plans and in the specifications, casing spacers, end seals, labor, and equipment to bore and install the encasement in accordance with the plans and specifications, complete and ready for use. The size shall be the measured internal diameter of the encasement pipe. The sizes of encasement to be paid under the size ranges specified in the bid items shall be as follows:

Range 1 = All encasement sizes greater than 2 inches to and including 6 inches
Range 2 = All encasement sizes greater than 6 inches to and including 10 inches
Range 3 = All encasement sizes greater than 10 inches to and including 14 inches
Range 4 = All encasement sizes greater than 14 inches to and including 18 inches
Range 5 = All encasement sizes greater than 18 inches to and including 24 inches
Range 6 = All encasement sizes greater than 24 inches

(Encasement sizes of 2 inches internal diameter or less shall not be paid separately; but, shall be considered incidental to the carrier pipe.) Payment under this bid item shall not include the carrier pipe. Carrier pipe shall be paid under a separate bid item. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

W ENCASEMENT STEEL OPEN CUT This item shall include the steel encasement pipe size as specified on the plans and in the specifications, casing spacers, end seals, labor, and equipment to open cut and install the encasement in accordance with the plans and specifications, complete and ready for use. The size shall be the measured internal diameter of the encasement pipe. The size encasement to be paid under the size ranges specified in the bid items shall be as follows:

Range 1 = All encasement sizes greater than 2 inches to and including 6 inches
Range 2 = All encasement sizes greater than 6 inches to and including 10 inches
Range 3 = All encasement sizes greater than 10 inches to and including 14 inches
Range 4 = All encasement sizes greater than 14 inches to and including 18 inches
Range 5 = All encasement sizes greater than 18 inches to and including 24 inches
Range 6 = All encasement sizes greater than 24 inches

(Encasement sizes of 2 inches internal diameter or less shall not be paid separately; but, shall be considered incidental to the carrier pipe.) Payment under this bid item shall not include the carrier pipe. Carrier pipe shall be paid under a separate bid item. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

W FIRE HYDRANT ADJUST Includes all labor, equipment, excavation, materials, and backfill to adjust the existing fire hydrant using the fire hydrant manufacturer's extension kit for adjustments of 18" or less. Adjustments greater than 18" require anchoring couplings and vertical bends to adjust to grade. The Contractor will supply and install all anchor couplings, bends, fire hydrant extension, concrete blocking, restoration, granular drainage material, etc, needed to adjust the fire hydrant complete and ready for use as shown on the plans, and in accordance with the specifications and standard drawings. This also includes allowing for the utility owner inspector to inspect the existing fire hydrant prior to adjusting, contractor returning unusable fire hydrants to the utility owner warehouse and picking up a replacement hydrant. No additional payment will be made for rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete and ready for use.

W FIRE HYDRANT ASSEMBLY Includes all labor, equipment, new fire hydrant, isolating valve and valve box, concrete pad around valve box (when specified in specifications or plans), piping, anchoring tee, anchoring couplings, fire hydrant extension, excavation, concrete blocking, granular drainage material, backfill, and restoration, to install a new fire hydrant assembly as indicated on plans and on standard drawings compete and ready for use. No additional payment will be made for rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W FIRE HYDRANT RELOCATE This item includes all labor and equipment to remove the existing fire hydrant from its existing location and reinstalling at a new location. This item shall include a new isolating valve and valve box, concrete pad around valve box (when required in specifications or plans), new piping, new anchoring tee, anchoring couplings, fire hydrant extensions, concrete blocking, restoration, granular drainage material, excavation, and backfill as indicated on plans, specifications, and on standard drawings compete and ready for use. This item shall also include allowing for utility owner inspector to inspect the existing fire hydrant prior to reuse, contractor returning unusable fire hydrants to the utility owner warehouse and picking up a replacement hydrant for use, if the existing fire hydrant is determined unfit for reuse. No additional payment will be made for rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W FIRE HYDRANT REMOVE This bid item includes removal of an abandoned fire hydrant, isolating valve, and valve box to the satisfaction of the engineer. The removed fire hydrant, isolating valve and valve box shall become the property of the contractor for his disposal as salvage or scrap. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W FLUSH HYDRANT ASSEMBLY This item shall include the flushing hydrant assembly, service line, tapping the main, labor, equipment, excavation, backfill, and restoration required to install the flush hydrant at the location shown on the plans and in accordance with the specifications and standard drawings, complete and ready for use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W FLUSHING ASSEMBLY This item shall include the flushing device assembly, service line, meter box and lid, tapping the main, labor, equipment, excavation, backfill, and restoration required to install the

flushing device at the location shown on the plans and in accordance with the specifications and standard drawings, complete and ready for use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W LINE MARKER This item is for payment for furnishing and installing a ground level water utility line marker as specified by the utility owner specifications and plans. A line marker may consist of a post or monument of whatever materials specified and shall include markings and/or signage on same as specified by plans or specifications. This item shall include all labor, equipment, and materials needed for complete installation of the marker. This item shall be paid EACH (EA) when complete.

W MAIN POINT RELOCATE This item is intended for payment for horizontal and/or vertical relocation of a short length of an existing main at the locations shown on the plans. This bid item is to be used to relocate an existing water main at point locations such as to clear a conflict at a proposed drainage structure, pipe or any other similar short relocation situation, and where the existing pipe material is to be reused. The contractor shall provide any additional pipe or fitting material needed to complete the work as shown on the plans and specifications. The materials provided shall be of the same type and specification as those that exist. Substitution of alternative materials shall be approved by the engineer in advance on a case by case basis. New polyethylene wrap is to be provided (if wrap exists or is specified in the specifications to be used). If it is necessary that the pipe be disassembled for relay, payment under this item shall also include replacement of joint gaskets as needed. Bedding and backfill shall be provided and performed the same as with any other pipe installation as detailed in the plans and specifications. Payment under this item shall be for each location requiring an existing main to be relocated horizontally or vertically regardless of pipe size or relocation length. No separate pay items will be established for pipe size variations or relocation segment length variations. Water Main Relocate shall not be paid on a linear feet basis; but, shall be Paid EACH (EA) at each location when complete and placed in service. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced.

W METER This item is for payment for installation of all standard water meters of all sizes 2 inches ID or less as specified on the plans. This item shall include all labor, equipment, meter, meter box, casting, yoke, and any other associated material needed for installation of a functioning water meter in accordance with the plans and specifications, complete and ready for use. This item shall include connections to the new or existing water service line. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W METER ADJUST This item includes all labor, equipment, excavation, materials, backfill, restoration, and etc., to adjust the meter casting to finished grade (whatever size exists) at the location shown on the plans or as directed in accordance with the specifications and standard drawings complete and ready for use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W METER RELOCATE This item includes all labor, equipment, excavation, additional fittings, disinfection, testing, restoration, and etc., to relocate the existing water meter (whatever size exists), meter yoke, meter box, casting, and etc., from its old location to the location shown on the plans or as directed, in accordance with the specifications and standard drawings complete and ready for use. The new service pipe (if required) will be paid under short side or long side service bid items. Any and all meter

relocations of 2 inches or less shall be paid under one bid item included in the contract regardless of size. Each individual relocation shall be paid individually under this item; however, no separate bid items will be established for meter size variations of 2 inches ID or less. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W METER VAULT SIZE RANGE 1 OR 2 This item is for payment for installation of an underground structure for housing of a larger water meter, fittings, and valves as required by the plans and specifications. This item shall include all labor, equipment, excavation, concrete, manhole castings or access doors, the specified meter(s) valve(s), all piping, and fitting materials associated with installing a functioning meter and vault in accordance with the plans, standard drawings, and specifications, complete and ready for use. The size shall be the measured internal diameter of the meter and piping to be installed. The size meter vault to be paid under size 1 or 2 shall be as follows:

Size Range 1 = All meter and piping sizes greater than 2 inches up to and including 6 inches
Size Range 2 = All meter and piping sizes greater than 6 inches

This item shall be paid EACH (EA) when complete. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced.

W METER/FIRE SERVICE COMBO VAULT This item is for payment for installation of an underground structure for housing of a water meter and fire service piping, fittings, and valves as required by the plans and specifications. This item shall include all labor, equipment, excavation, concrete, manhole castings or access doors, the specified meter(s), valve(s), all piping, and fitting materials associated with installing a functioning meter and fire service vault in accordance with the plans and specifications, complete and ready for use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W METER WITH PRESSURE REDUCING VALVE (PRV) This item is for payment for installation of all standard water meters with pressure reducing valves (PRV) of all sizes 2 inches ID or less as specified on the plans. This item shall include all labor, equipment, meter, PRV, meter box, casting, yoke, and any other associated material needed for installation of a functioning water meter with PRV in accordance with the plans and specifications, complete and ready for use. This item shall include connections to the new or existing water service line. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W PIPE This description shall apply to all PVC, ductile iron, and polyethylene/plastic pipe bid items of every size and type to be used as water main, except those bid items defined as "Special". This item includes the pipe specified by the plans and specifications, all fittings (including, but not limited to, bends, tees, reducers, plugs, and caps), tracing wire with test boxes (if required by specification), polyethylene wrap (when specified), labor, equipment, excavation, bedding, restoration, testing, backfill, and etc., required to install the specified new pipe and new fittings at the locations shown on the plans, or as directed, in accordance with the specifications and standard drawings complete and ready for use. No additional payment will be made for rock excavation. This bid item includes material and placement of flowable fill under existing and proposed pavement, and wherever else specified on the plans or in the specifications. This item shall also include pipe anchors, at each end of polyethylene pipe runs when

specified to prevent the creep or contraction of the pipe. Measurement of quantities under this item shall be through fittings, encasements, and directional bores (only when a separate carrier pipe is specified within the directional bore pipe). Measurements shall be further defined to be to the center of tie-in where new pipe contacts existing pipe at the center of connecting fittings, to the outside face of vault or structure walls, or to the point of main termination at dead ends. No separate payment will be made under pipe items when the directional bore pipe is the carrier pipe. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

W PLUG EXISTING MAIN This item shall include the specified plug, concrete blocking and/or anchoring, labor, equipment, excavation, backfill, and restoration required to install the plug in an existing in-service main that is to remain at the location shown on the plans or as directed in accordance with the specifications. Any and all plugs on all existing in-service mains shall be paid under one bid item included in the contract regardless of size. No separate bid items will be established for size variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

NOTE: This utility bid item is not to be paid on new main installations or abandoned mains. This pay item is to plug existing in-service mains only. Plugs on new mains are incidental to the new main just like all other fittings.

NOTE: Plugging of existing abandon mains shall be performed and paid in accordance with Section 708.03.05 of KYTC Standard Specifications For Road And Bridge Construction and paid using Bid Code 01314 Plug Pipe.

W PRESSURE REDUCING VALVE This description shall apply to all pressure reducing valves (PRV) of every size required in the plans and specifications except those bid items defined as "Special". Payment under this description is to be for PRVs being installed with new main. This item includes the PRV as specified in the plans and specifications, polyethylene wrap (if required by specification), labor, equipment, excavation, anchoring (if any), pit or vault, backfill, restoration, testing, disinfection, and etc., required to install the specified PRV at the location shown on the plans in accordance with the specifications and standard drawings complete and ready for use. If required on plans and/or proposed adjoining DIP is restrained, PRVs shall be restrained. PRV restraint shall be considered incidental to the PRV and adjoining pipe. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W PUMP STATION This item is for payment for installation of pumps and an above or below ground structure for housing of the pumps. This item shall include all pumps, piping, fittings, valves, electrical components, building materials, concrete, any other appurtenances, labor, equipment, excavation, and backfill, to complete the pump station installation as required by the plans, standard drawings, and specifications, complete and ready for use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LUMP SUM (LS) when complete.

W REMOVE TRANSITE (AC) PIPE This item shall include all labor, equipment, and materials needed for removal and disposal of the pipe as hazardous material. All work shall be performed by trained and certified personnel in accordance with all environmental laws and regulations.
Any and all transite AC pipe removed shall be paid under one bid item included in the contract regardless

of size. No separate bid items will be established for size variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid LINEAR FEET (LF) when complete.

W SERVICE LONG SIDE This bid item description shall apply to all service line installations of every size bid up to and including 2 inch inside diameter, except those service bid items defined as "Special". This item includes the specified piping material, main tap, tapping saddle (if required), and corporation stop materials, coupling for connecting the new piping to the surviving existing piping, encasement of 2 inches or less internal diameter (if required by plan or specification), labor, equipment, excavation, backfill, testing, disinfection, and restoration, at the locations shown on the plans or as directed, in accordance with the specifications and standard drawings, complete and ready for use. This bid item is to pay for service installations where the ends of the service connection are on opposite sides of the public roadway and the service line crosses the centerline of the public roadway as shown on the plans. The length of the service line is not to be specified. Payment under this item shall not be restricted by a minimum or maximum length. The contractor shall draw his own conclusions as to the length of piping that may be needed. Payment under this item shall include boring, jacking, or excavating across the public roadway for placement. Placement of a service across a private residential or commercial entrance alone shall not be reason to make payment under this item. Private or commercial entrances shall not be considered a public roadway in defining payment under this item. This pay item does not include installation or relocation of meters. Meters will be paid separately. No additional payment will be made for rock excavation or for special bedding required in rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W SERVICE SHORT SIDE This bid item description shall apply to all service line installations of every size up to and including 2 inch internal diameter, except those service bid items defined as "Special". This item includes installation of the specified piping material of the size specified on plans, encasement of 2 inches or less internal diameter (if required by plan or specification), main tap, tapping saddle (if required), corporation stop, coupling for connecting the new piping to the surviving existing piping, labor, equipment, excavation, backfill, testing, disinfection, and restoration, at the locations shown on the plans or as directed, in accordance with the specifications and standard drawings, complete and ready for use. This bid item is to pay for service installations were both ends of the service connection are on the same side of the public roadway, or when an existing service crossing a public roadway will remain and is being extended, reconnected, or relocated with all work on one side of the public roadway centerline as shown on the plans. The length of the service line is not to be specified and shall not be restricted to any minimum or maximum length. Payment shall be made under this item even if the service crosses a private residential or commercial entrance; but, not a public roadway.
Private or commercial entrances shall not be considered a public roadway in defining payment under this item. The contractor shall draw his own conclusions as to the length of piping that may be needed. This pay item does not include installation or relocation of meters. Meters will be paid separately. No additional payment will be made for rock excavation or for bedding required in rock excavation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W SERVICE RELOCATE This item is for the relocation of an existing water service line where a meter is not involved, and where an existing service line can easily be adjusted by excavating alongside and moving the line horizontally and/or vertically a short distance without cutting the service line to avoid conflicts with road construction. This item shall include excavation, labor, equipment, bedding, and

backfill to relocate the line in accordance with the plans and specifications complete and ready for use. Payment under this item shall be for each location requiring relocation. Payment shall be made under this item regardless of service size or relocation length. No separate pay items will be established for size or length variation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W STRUCTURE ABANDONMENT This item is to be used to pay for abandonment of larger above or below ground water structures such as meter vaults, fire pits, pump stations, tanks, and etc. Payment under this time shall not be limited to size or scope; however structures with connecting pipes of 2 inches or less shall not be paid under this item; but, shall be considered incidental to water construction, (i.e., abandonment of standard water meters up to and including 2 inches would not be paid under this item). Payment under this item shall include all labor, equipment, and compacted fill or flowable fill for abandonment of the structure in place and restoration complete. No separate bid items will be established for size or structure variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W STRUCTURE REMOVAL This item is to be used to pay for removal of larger above or below ground water structures such as meter vaults, fire pits, pump stations, tanks, and etc. Payment under this time shall not be limited to size or scope; however structures with connecting pipes of 2 inches or less shall not be paid under this item; but, shall be considered incidental to water construction, (i.e., removal of standard water meters up to and including 2 inches would not be paid under this item). Payment under this item shall include all labor, equipment, and compacted backfill for removal of the structure and restoration complete. No separate bid items will be established for size or structure variations. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W TAPPING SLEVE AND VALVE SIZE 1 OR 2 This item shall include the specified tapping sleeve, valve, valve box, concrete pad around valve box (when required in specifications or plans), labor, and equipment to install the specified tapping sleeve and valve, complete and ready for use in accordance with the plans and specifications. The size shall be the measured internal diameter of the live pipe to be tapped. The size tapping sleeve and valve to be paid under sizes 1 or 2 shall be as follows:

Size 1 = All live tapped main sizes up to and including 8 inches
Size 2 = All live tapped main sizes greater than 8 inches

Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W TIE-IN This bid description shall be used for all main tie-in bid items of every size except those defined as "Special". This item includes all labor, equipment, excavation, fittings, sleeves, reducers, couplings, blocking, anchoring, restoration, disinfection, testing and backfill required to make the water main tie-in as shown on the plans, and in accordance with the specifications complete and ready for use. Pipe for tie-ins shall be paid under separate bid items. This item shall be paid EACH (EA) when complete.

W VALVE This description shall apply to all valves of every size required in the plans and specifications

except those bid items defined as "Special". Payment under this description is to be for gate or butterfly valves being installed with new main. This item includes the valve as specified in the plans and specifications, polyethylene wrap (if required by specification), labor, equipment, excavation, anchoring (if any), valve box and valve stem extensions, backfill, concrete pad around valve box (if required by specification), restoration, testing, disinfection, and etc., required to install the specified valve at the location shown on the plans in accordance with the specifications and standard drawings complete and ready for use. If required on plans and/or proposed adjoining DIP is restrained, valves shall be restrained. Valve restraint shall be considered incidental to the valve and adjoining pipe. This description does not apply to cut-in valves. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W VALVE ANCHOR EXISTING This bid item is intended to pay for installation of restraint hardware on an existing valve where no restraint exists to hold the valve in place to facilitate tie-ins and other procedures where restraint is prudent. This work shall be performed in accordance with water specifications and plans. This bid item shall include all labor equipment, excavation, materials and backfill to complete restraint of the designated valve, regardless of size, at the location shown on the plans, complete and ready for use. Materials to be provided may include, but is not limited to, retainer glands, lugs, threaded rod, concrete, reinforcing steel or any other material needed to complete the restraint. Should the associated valve box require removal to complete the restraint, the contractor shall reinstall the existing valve box, the cost of which shall be considered incidental to this bid item. No separate bid items are being provided for size variations. All sizes shall be paid under one bid item. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W VALVE BOX ADJUST Includes all labor, equipment, valve box and valve stem extensions (if required), excavation, backfill, concrete pad around valve box (when specified in specifications or plans), restoration, and etc., to adjust the top of the box to finished grade complete and ready for use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W VALVE CUT-IN This bid description is for new cut-in valve installations of all sizes where installation is accomplished by cutting out a section of existing main. This item shall include cutting the existing pipe, supplying the specified valve, couplings or sleeves, valve box, concrete pad around valve box (when required in specifications or plans), labor, equipment, and materials to install the valve at the locations shown on the plans, or as directed by the engineer, complete and ready for use. Any pipe required for installation shall be cut from that pipe removed or supplied new by the contractor. No separate payment will be made for pipe required for cut-in valve installation. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

W VALVE VAULT This item is for payment for installation of an underground structure for housing of specific valve(s) as required by the plans and specifications. This item shall include all labor, equipment, excavation, concrete, manhole castings or doors, the specified valve(s), all piping, and fitting materials associated with installing a functioning valve vault in accordance with the plans, standard drawing, and specifications, complete and ready for use. Please refer to the Utility Company's Specifications. If the Company does not have specifications, KYTC's Specifications shall be referenced. This item shall be paid EACH (EA) when complete.

SECTION 013323 – SHOP DRAWINGS, PRODUCT DATA, SAMPLES AND RFI'S

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. General: This section specifies procedural requirements for non-administrative submittals including shop drawings, product data, samples (when samples are specifically requested) and other miscellaneous work-related submittals. Shop drawings, product data, samples and other work-related submittals are required to amplify, expand and coordinate the information contained in the Contract Documents.

B. Refer to other Division-01 sections and other Contract Documents for Specifications on administrative, non-work-related submittals. Such submittals include, but are not limited to the following items:

1. Permits.
2. Payment applications.
3. Performance and payment bonds.
4. Insurance certificates.
5. Inspection and test reports.
6. Schedule of values.
7. Progress reports.
8. Listing of subcontractors.
9. Operating and Maintenance Manuals

C. Engineer prefers initial submittals be in electronic media along with one paper copy for review. Engineer utilizes Newforma software and will provide Contractor with the necessary links and instructions for submittal purposes. Upon completion of the review process, Contractor shall print three (3) copies of complete submittal, including transmittal cover page and stamp page, and deliver to Engineer.

If Contractor does not have capability to submit electronic submittals, then Contractor shall submit a request to Engineer for waiver. In the event a waiver is granted, paper submittals shall be provided as directed by the Engineer.

D. Submittals shall be checked and reviewed by the Contractor and stamped with Contractor's review stamp before submission to the Engineer. The review of the submittals by the Engineer shall not be construed as a complete check but will indicate only that the general method of construction and detailing is satisfactory. Review of such submittals will not relieve the Contractor of the responsibility for any errors which may exist as the Contractor shall be responsible for the dimensions and design of adequate connections, details, and satisfactory construction of all work.

E. All Requests for Information (RFI) to Engineer shall be submitted electronically via Engineer's Newforma software.

1.2 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division-01 Specification sections, apply to work of this section.

1.3 DEFINITIONS

A. Shop drawings are technical drawings and data that have been specially prepared for this project, including but not limited to the following items:

1. Fabrication and installation drawings.
2. Setting diagrams.
3. Shopwork manufacturing instructions.
4. Templates.
5. Patterns.
6. Coordination drawings (for use on site).
7. Schedules.
8. Design mix formulas.
9. Contractor's engineering calculations.

Standard information prepared without specific reference to a project is not considered to be shop drawings.

B. Product data includes standard printed information on manufactured products that has not been specially-prepared for this project, including but not limited to the following items:

1. Manufacturer's product specifications and installation instructions.
2. Standard color charts.
3. Catalog cuts.
4. Roughing in diagrams and templates.
5. Standard wiring diagrams.
6. Printed performance curves.
7. Operational range diagrams.
8. Mill reports.
9. Standard product operating and maintenance manuals.

C. Samples, where specifically required, are physical examples of work, including but not limited to the following items:

1. Partial sections of manufactured or fabricated work.
2. Small cuts or containers of materials.
3. Complete units of repetitively used materials.
4. Swatches showing color, texture, and pattern.
5. Color range sets.
6. Units of work to be used for independent inspection and testing.

D. Miscellaneous submittals are work-related, non-administrative submittals that do not fit in the three previous categories, including, but not limited to the following:

1. Specially prepared and standard printed warranties.
2. Maintenance agreements.

3. Workmanship bonds.
4. Survey data and reports.
5. Testing and certification reports.
6. Record drawings.
7. Field measurement data.

1.4 SUBMITTAL PROCEDURES

A. General: Refer to the General Conditions and Paragraph 1.1 hereinbefore for basic requirements for submittal handling.

B. Coordination: Coordinate the preparation and processing of submittals with the performance of the work. Coordinate each separate submittal with other submittals and related activities such as testing, purchasing, fabrication, delivery and similar activities that require sequential activity.

It is the Contractor's responsibility to make such field measurements as are needed to base submittals on actual field conditions to assure proper connection, fit, function and performance of all work and equipment in the execution of the contract work.

Coordinate the submittal of different units of interrelated work so that one submittal will not be delayed by the Architect/Engineer's need to review a related submittal. The Architect/Engineer reserves the right to withhold action on any submittal requiring coordination with other submittals until related submittals are forthcoming.

C. Coordination of Submittal Times: Prepare and transmit each submittal to the Architect/Engineer sufficiently in advance of the scheduled performance of related work and other applicable activities. Transmit different kinds of submittals for the same unit of work so that processing will not be delayed by the Architect/Engineer's need to review submittals concurrently for coordination.

D. Review Time: Allow fourteen (14) days so that the installation will not be delayed as a result of the time required to properly process submittals, including time for resubmittal, if necessary. Advise the Architect/Engineer on each submittal, as to whether processing time is critical to the progress of the work and if the work would be expedited if processing time could be shortened.

1. Allow a longer time period where processing must be delayed for coordination with subsequent submittals. The Architect/Engineer will advise the Contractor promptly when it is determined that a submittal being processed must be delayed for coordination.
2. No extension of time will be authorized because of the Contractor's failure to transmit submittals to the Architect/Engineer sufficiently in advance of the work.

E. Submittal Preparation: Mark each submittal with a permanent label for identification. Provide the following information on the label for proper processing and recording of action taken.

1. Project name.
2. Date.
3. Name and address of Architect/Engineer.
4. Name and address of Contractor.
5. Name and address of subcontractor.
6. Name and address of supplier.

7. Name of manufacturer.
8. Number and title of appropriate specification section.
9. Drawing number and detail references, as appropriate.
10. Similar definitive information as necessary.

F. All submittals shall be referenced to the applicable item, section and division of the Specifications, and to the applicable drawing(s) or drawing schedule(s). Include only one item in a submittal.

G. The Contractor shall review and check submittals and shall indicate his review by initials and date. Any submittal received without this evidence of review shall be returned to the Contractor without review.

H. If the submittals deviate from the Contract Drawings and/or Specifications, the Contractor shall advise the Engineer in writing of the deviation and the reasons, therefore.

I. Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the Architect/Engineer, and to other destinations as indicated, by use of a transmittal form. Submittals received from sources other than the Contractor will be returned to the sender "without action".

J. Electronic Submittals: If the electronic method of submittals is agreed to by Contractor, Engineer, and Owner, the format and procedures will be determined and implemented prior to any submittals. Submittals will be processed through "Newforma" software. Each item of the submittal documents shall be in .pdf format and shall be oriented so that they are read from upper left corner to lower right corner, with no rotation of said document being required after receiving it. The .pdf file shall be named so that it describes the item being submitted. All other requirements herein are part of the electronic submittal process with the exception of the duplicate copies. Contractor stamp indicating review and any comments or notes must be on the .pdf submittal.

1.5 SPECIFIC SUBMITTAL REQUIREMENTS

A. Shop drawings shall be prepared by a qualified detailer. Details shall be identified by reference to sheet and detail numbers shown on Contract Drawings. Where applicable, show fabrication, layout, setting and erection details.

Shop drawings are defined as original drawings prepared by the Contractor, subcontractors, suppliers, or distributors performing work under this Contract. Shop drawings illustrate some portion of the work and show fabrication, layout, setting or erection details of equipment, materials and components. The Contractor shall, except as otherwise noted, have prepared the number of reviewed copies required for his distribution plus four (4) which will be retained by the Engineer. Shop drawings shall be folded to an approximate size of 8-1/2 inches x 11 inches and in such manner that the title block will be located in the lower right-hand corner of the exposed surface.

B. Project data shall include the manufacturer's standard schematic drawings modified to delete information, which is not applicable to the project, and shall be supplemented to provide additional information applicable to the project. Each copy of descriptive literature shall be clearly marked to identify pertinent information as it applies to the project.

C. Where samples are required, they shall be adequate to illustrate materials, equipment or workmanship, and to establish standards by which completed work is judged. Provide sufficient size and quantity to clearly illustrate functional characteristics of product and material, with integrally related parts and attachment devices, along with a full range of color samples.

D. In the event the Engineer does not specifically reject the use of material or equipment at variance to that which is shown on the Drawings or specified, the Contractor shall, at no additional expense to the Owner, and using methods reviewed by the Engineer, make any changes to structures, piping, controls, electrical work, mechanical work, etc., that may be necessary to accommodate this equipment or material. Should equipment other than that on which design drawings are based be accepted by the Engineer, shop drawings shall be submitted detailing all modification work and equipment changes made necessary by the substituted item.

E. Additional information on particular items, such as special drawings, schedules, calculations, performance curves, and material details, shall be provided when specifically requested in the Technical Specifications.

F. Submittals for all electrically operated items (including instrumentation and controls) shall include complete size, color coding, all terminations and connections, and coordination with related equipment.

G. Equipment shop drawings shall indicate all factory or shop paint coatings applied by suppliers, manufacturers and fabricators; the Contractor shall be responsible for insuring the compatibility of such coatings with the field-applied paint products and systems.

H. Fastener specifications of manufacturer shall be indicated on equipment shop drawings.

I. Where manufacturers brand names are given in the Specifications for building and construction materials and products, such as grout, bonding compounds, curing compounds, masonry cleaners, waterproofing solutions and similar products, the Contractor shall submit names and descriptive literature of such materials and products he proposes to use in this Contract.

J. No material shall be fabricated or shipped unless the applicable drawings or submittals have been reviewed by the Engineer and returned to the Contractor.

K. All bulletins, brochures, instructions, parts lists, and warranties package with and accompanying materials and products delivered to and installed in the project shall be saved and transmitted to the Owner through the Engineer.

1.6 REVIEW STATUS

A. Submittals will be returned, stamped with the following classifications: "Reviewed", "Furnish as Corrected", "Revise and Resubmit", "Rejected", or "Submit Specified Item".

B. In some instances, corrections to dimensions or clarification notations will be required, in which case the drawings will be marked "Furnish as Corrected." These shop drawings will not be required to be resubmitted for further approval. If the supplier makes additional modifications

after receiving a "Furnish as Corrected" disposition, the drawings must then be resubmitted for review.

C. If the shop drawing is returned with the notation "Revise and Resubmit", the Contractor shall promptly make the revisions indicated and repeat the submittal approval procedure.

D. If the shop drawing is returned with the notation "Submit Specified Item", this indicates that the submittal does not meet the specification, will not be reviewed, and is unacceptable. Upon return of a drawing so marked, the Contractor shall repeat the initial approval procedure, submitting acceptable materials or equipment.

E. The "Rejected" notation is used to indicate materials or equipment that are not acceptable and are not included in the project.

1.7 REMINDER OF CONTRACTOR RESPONSIBILITIES

A. Verify field measurements, field construction criteria, catalog numbers, and similar data.

B. Coordinate each submittal with requirements of work and of Contract Documents.

C. Notify Engineer, in writing at time of submission, of deviations in submittals from requirements of Contract Documents.

D. Begin no work, and have no material or products fabricated or shipped which requires submittals until return of submittals with Engineer's stamp and initials or signature indicating review.

E. Upon review and close-out of a submittal, Contractor shall print three (3) copies of complete submittal, including transmittal cover page and stamp page, and deliver to Engineer.

F. It is emphasized that the review of shop drawings by the Engineer is for general conformance to the Contract Drawings and Specifications, but subject to the detailed requirements of the Contract Drawings and Specifications. Although the Engineer may check submitted data in more or less detail, such checking is an effort to discover errors and omissions in the Contractor's drawings and to assist the Contractor in coordinating and expediting his work, but shall in no way relieve the Contractor of his obligation and responsibility to properly coordinate the work, and to Engineer the details of the work in such a manner, that the purpose and intent of the Contract will be achieved nor shall any such detailed checking by the Engineer be construed as placing on him or on the Owner, any responsibility for the accuracy, proper fit, functioning or performance of any phase of the work included in this Contract. The Contractor is responsible for confirmation and correlation of dimensions at the job site; for information that pertains solely to the fabrication processes or to the techniques of construction; for the coordination of the work of all trades; and for performance of his work in a safe and satisfactory manner.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

The following is a description of the procedures to be followed for all submittals including, but not limited to, Shop Drawings, Product Data, Samples, & RFI's Certificates, Calculations, Procedures/Reports, Warranties, and Operations and Maintenance Manual Data, Refer to Section 013323 – Shop Drawings, Product Data, Samples & RFI's for detailed requirements.

3.1 PREPARING SUBMITTAL

A. Complete GRW's Submittal Stamp Page

1. GRW's Submittal Stamp Page will be provided to the Contractor and will be pre-filled with project-specific information and the Contractor's contact information.

2. The Contractor fills in the following:

- Number of copies submitted
- Submittal ID Number

Submittal ID Numbers consist of the specification number-sequence number

264313-01 – submittal #1 for spec number 264313
264313-02 – submittal #2 for spec number 264313
266013-01 – submittal #1 for spec number 266013

Resubmittal ID numbers consist of the specification number-sequence number-revision number

264313-01-**01** – 1st resubmittal of 264313-01
264313-01-**02** – 2nd resubmittal of 264313-01

- Submittal Description (should be unique for each submittal)
- Contractor's signature on the Stamp Page indicating compliance with submittal requirements
- Contractor's stamp (if the Contractor does not have a stamp, this may be left blank)

B. Any corrections or notations added to submittals by the Contractor or any of his agents, shall be done in ink (blue, black, or green).

C. Red will be reserved for the Engineer's notations and corrections.

D. **Add the Submittal Stamp Page as the first page of the submittal and scan the entire document as one (1) PDF file to send through Newforma.**

3.2 SENDING SUBMITTAL VIA NEWFORMA

A. Provide the Engineer with the email addresses of each team member who will be using Newforma. The Engineer will use this information to give access to the website.

B. The Contractor will then receive an email from Newforma asking them to set up their username/password. The email will contain a link to the site, or you can log into Newforma's Info Exchange site at the following address (https://info.grwinc.com/userweb/login/login.aspx).

3.3 SUBMITTAL CLASSIFICATIONS

A. Submittals will be returned (via Newforma) to the Contractor stamped by GRW with one of the following classifications:

1. "Reviewed"
   This indicates the Engineer has reviewed the submittal for general conformance to the Contract Documents, but subject to the detailed requirements of the Contract Documents.

2. "Furnish as Corrected"
   This indicates corrections or clarifications have been noted on the submittal. This submittal will not be required to be resubmitted for further approval.

3. "Revise and Resubmit"
   This indicates the Contractor must promptly make revisions indicated and repeat the submittal process using a resubmittal number.

4. "Submit Specified Item"
   This indicates a specific item included in the submittal does not meet the requirements of the Contract Documents. The Contractor must promptly make revisions and repeat the submittal process.

5. "Rejected"
   This indicates the submittal is not acceptable or not to be included in the project.

3.4 PREPARING HARD COPIES

A. The Contractor shall mail the Engineer three (3) hard copies of each submittal which has been marked as either "Reviewed" or "Furnish as Corrected".

NOTE: Submittals will not be considered final until the hard copies have been received by the Engineer and may not be eligible for billing until such time.

END OF SECTION 013323

SECTION 014500 – QUALITY CONTROL SERVICES - LINE PROJECT

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. Required inspection and testing services are intended to assist in the determination of probable compliance of the Work with requirements specified or indicated. These required services do not relieve the Contractor of responsibility for compliance with these requirements or for compliance with requirements of the Contract Documents.

B. 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.

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

D. 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 or tests to be conducted at the field shall be done in the presence of the Engineer or his representative.

E. Certifications by independent testing laboratories may be by copy of the attest 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.

F. Inspections, tests and related actions specified in this section and elsewhere in the Contract Documents are not intended to limit the Contractor's own quality control procedures which facilitate overall compliance with requirements of the Contract Documents.

1.2 RELATED DOCUMENTS

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

1.3 SUBMITTALS

A. General: Refer to Section 013323 for the general requirements on submittals. Submit a certified written report of each inspection, test or similar service, directly to the Architect/Engineer.

B. Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to the following:

1. Name of testing agency or test laboratory.
2. Dates and locations of samples and tests or inspections.
3. Names of individuals making the inspection or test.
4. Designation of the work and test method.
5. Complete inspection or test data.

6. Test results.
7. Interpretations of test results.
8. Notation of significant ambient conditions at the time of sample-taking and testing.
9. Comments or professional opinion as to whether inspected or tested work complies with requirements of the Contract Documents.
10. Recommendations on retesting, if applicable.

1.4 RESPONSIBILITIES

A. Contractor Responsibilities: Except where they are specifically indicated as being the Owner's responsibility, or where they are to be provided by another identified entity, inspections, tests and similar quality control services are the Contractor's responsibility; these services also include those specified to be performed by an independent agency and not directly by the Contractor. Costs for these services shall be included in the Contract Sum. The Contractor shall employ and pay an independent agency, testing laboratory or other qualified firm to perform quality control services specified.

B. Retest Responsibility: Where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance of related Work with the requirements of the Contract Documents, then retests are the responsibility of the Contractor, regardless of whether the original test was the Contractor's responsibility. Retesting of work revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original Work.

C. Responsibility for Associated Services: The Contractor is required to cooperate with the independent performing required inspections, tests and similar services. Provide such auxiliary services as are reasonably requested. Notify the testing agency sufficiently in advance of operations to permit assignment of personnel. These auxiliary services include but are not necessarily limited to the following:

1. Providing access to the work.
2. Taking samples or assistance with taking samples.
3. Delivery of Samples to test laboratories.
4. Delivery and protection of samples and test equipment at the project site.

D. Coordination: The Contractor and each independent agency engaged to perform inspections, tests and similar services for the project shall coordinate the sequence of their activities so as to accommodate required services with a minimum of delay in the progress of the Work. In addition, the Contractor and each independent testing agency shall coordinate their Work so as to avoid the necessity of removing and replacing Work to accommodate inspections and tests. The Contractor is responsible for scheduling times for inspections, tests, taking of samples and similar activities.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. Upon completion of inspection, testing, sample taking and similar services performed on the Work, repair damaged work and restore substrates and finishes to eliminate deficiencies, including deficiencies in the visual qualities of exposed finishes. Comply with the Contract Document requirements for "Cutting and Patching". Protect Work exposed by or for quality control service activities and protect repaired work. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing, or similar services.

END OF SECTION 014500

SECTION 017400 – CLEANING

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. Maintain premises free from accumulations of waste, debris, and rubbish.

B. At completion of work, remove waste materials, rubbish, tools, equipment, machinery and surplus materials, and clean all exposed surfaces. Leave project clean and ready for occupancy.

1.2 RELATED DOCUMENTS

A.	Cutting and Patching	Section 017329.
B.	Project Closeout:	Section 017700.
C.	Cleaning for Specific Products of Work:	Specification Section for that work.

1.3 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 violative noxious substances.

B. Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.

1. Do not burn or bury rubbish and waste materials on project site.
2. Do not dispose of volatile wastes such as mineral spirits, oil, or paint thinner in storm or sanitary drains.
3. Do not dispose of wastes into streams or waterways.

PART 2 - PRODUCTS

2.1 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

3.1 DURING CONSTRUCTION

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

B. Wet down dry materials and rubbish to lay dust and prevent 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 Owner's property.

F. Handle materials in a controlled manner with as few handlings as possible; do not drop or throw materials from heights.

G. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.

3.2 FINAL CLEANING

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

B. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.

C. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials, from sight-exposed interior or exterior finished surfaces; polish surfaces so designated to shine finish.

D. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.

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

F. Maintain cleaning until project, or portion thereof, is occupied by Owner.

END OF SECTION 017400

SECTION 017700 – PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS SPECIFIED ELSEWHERE

A. Project Record Documents: Section 017839.

1.2 SUBSTANTIAL COMPLETION

A. In order to initiate project closeout procedures, the Contractor shall submit the following:

1. Written certification to Engineer that project is Substantially Complete.
2. List of major items to be completed or corrected.

B. Engineer will make an inspection within seven (7) days after receipt of certification, together with Owner's Representative.

C. Should Engineer consider that work is Substantially Complete:

1. Contractor shall prepare, and submit to Engineer, a list of items to be completed or corrected, as determined by the inspection.
2. Engineer will prepare and issue a Certificate of Substantial Completion, containing:

a. Date of Substantial Completion.
b. Contractor's list of items to be completed or corrected, verified, and amended by Engineer.
c. The time within which Contractor shall complete or correct work of listed items.
d. Time and date Owner will assume possession of work or designated portion thereof.
e. Responsibilities of Owner and Contractor for:

1) Insurance
2) Utilities
3) Operation of Mechanical, Electrical, and Other Systems.
4) Maintenance and Cleaning.
5) Security.

f. Signatures of:

1) Engineer
2) Contractor
3) Owner

3. Owner occupancy of Project or Designated Portion of Project:

a. Contractor shall:

1) Obtain certificate of occupancy.
2) Perform final cleaning in accordance with Section 017400.

b. Owner will occupy Project, under provisions stated in Certificates of Substantial Completion.

4. Contractor: Complete work listed for completion or correction, within the designated time.

D. Should Engineer consider that work is not Substantially Complete:

1. He shall immediately notify Contractor, in writing, stating reasons.
2. Contractor: Complete work, and send second written Engineer, certifying that Project, or designated portion of Project is substantially complete.
3. Engineer will reinspect work.

E. Should Engineer consider that work is still not finally complete:

1. He shall notify Contractor, in writing, stating reasons.
2. Contractor shall take immediate steps to remedy the stated deficiencies and send a third written notice to the Engineer certifying that the work is complete.
3. Engineer and Owner will reinspect work at Contractor's expense.

1.3 FINAL INSPECTION

A. Contractor shall submit written certification that:

1. Contract Documents have been reviewed.
2. Project has been inspected for compliance with Contract Documents.
3. Work has been completed in accordance with Contract Documents.
4. Equipment and systems have been tested in the presence of the Owner's Representative and are operational.
5. Project is completed, and ready for final inspection.

B. Engineer will make final inspection within seven (7) days after receipt of certification.

C. Should Engineer consider that work is finally complete in accordance with requirements of Contract Documents, he shall request Contractor to make Project Closeout submittals.

D. Should Engineer consider that work is not finally complete:

1. He shall notify Contractor in writing, stating reasons.
2. Contractor shall take immediate steps to remedy the stated deficiencies and send a second written notice to Engineer certifying that work is complete.
3. Engineer will reinspect work.

1.4 CLOSEOUT SUBMITTALS

A. Project Record Documents: To requirements of Section 017839.

B. Guarantees, Warranties and Bonds: To requirements of particular technical Specifications and Section 017834.

1.5 INSTRUCTION

A. Instruct Owner's personnel in operation of all systems, mechanical, electrical, and other equipment.

1.6 FINAL APPLICATION FOR PAYMENT

A. Contractor shall submit final applications in accordance with requirements of General Conditions.

1.7 FINAL CERTIFICATE FOR PAYMENT

A. Engineer will issue final certificate in accordance with provisions of general conditions.

B. Should final completion be materially delayed through no fault of Contractor, Engineer may issue a Semi-Final Certificate for Payment.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 017700

SECTION 017834 – WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

A. Compile specified warranties and bonds.

B. Compile specified service and maintenance contracts.

C. Co-execute submittals when so specified.

D. Review submittals to verify compliance with Contract Documents.

E. Submit to Engineer for review and transmittal to Owner. **Comply with provisions of Section 013323.**

1.2 RELATED DOCUMENTS

A. Bid Bond: Instructions to Bidders.

B. Performance and Payment Bonds: General Conditions and Supplemental General Conditions.

C. Guaranty: General Conditions and Supplemental General Conditions.

D. General Warranty of Construction: General Conditions.

E. Project Closeout: Section 017700.

F. Warranties and Bonds required for specific products: As listed in technical specifications in these Contract Documents herein.

G. Provisions of Warranties and Bonds, Duration: Respective specification sections for particular products.

1.3 SUBMITTALS REQUIREMENTS

A. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers and subcontractors.

B. Furnish two (2) original signed copies.

C. Table of Contents: Neatly typed, in orderly sequence. Provide complete information for each item.

1. Product, equipment or work item.

2. Firm name, address and telephone number.
3. Scope
4. Date of beginning of warranty, bond or service and maintenance contract.
5. Duration of warranty, bond or service and maintenance contract.
6. Provide information for Owner's personnel:

    a. Proper procedure in case of failure.
    b. Instances which might affect the validity of warranty or bond.

7. Contractor name, address and telephone number.

1.4 FORM OF SUBMITTALS

A. Prepare duplicate packets.

B. Format:

1. Size 8-1/2 inches. x 11 inches, punch sheets for 3-ring binder.

    a. Fold larger sheets to fit into binders.

2. Cover: Identify each packet with the typed or printed title "WARRANTIES AND BONDS." List:

    a. Title of Project
    b. Name of Contractor

C. Binders: Commercial quality, three-ring, with durable and cleanable plastic covers.

1.5 TIME OF SUBMITTALS

A. For equipment or component parts of equipment put into service during progress of construction:

1. Submit documents within 10 days after inspection and acceptance.

B. Otherwise make submittals within 10 days after date of substantial completion, prior to final request for payment.

C. For items of work, where acceptance is delayed materially beyond the Date of Substantial Completion, provide updated submittal within 10 days after acceptance, listing the date of acceptance as the start of the warranty period.

1.6 SUBMITTALS REQUIRED

A. Submit warranties, bonds, service and maintenance contracts as specified in the respective sections of the Specifications.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 017834

SECTION 017839 – PROJECT RECORD DOCUMENTS - WATER

PART 1 - GENERAL

1.1 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 the Engineer and Owner.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Shop Drawings, Product Data, and Samples: Section 013323.

1.3 MARKING DEVICES

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

1.4 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 the 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 the 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. Coordinate and confirm with Engineer that electronic versions of all shop drawings have been provided to Engineer.

1.5 SUBMITTALS

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.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 017839

DIVISION 02

EXISTING CONDITIONS

SECTION 024100 – DEMOLITION & SALVAGE

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment and services required for demolition as shown on the Drawings and specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork: Section 312000

1.3 PROCEDURE

A. The procedures proposed for the accomplishment of salvage and demolition work shall be submitted for review. The procedures shall provide for safe conduct of the work, careful removal and disposition of materials specified to be salvaged, protection of property which is to remain undisturbed, coordination with other work in progress and timely disconnection of utility services. The procedures shall include a detailed description of the methods and equipment to be used for each operation, and the sequence of operations.

B. It is the responsibility of the Contractor to visit the site to familiarize himself with the amount of Work that is included under this Section.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 DUST CONTROL

A. The amount of dust resulting from the demolition shall be controlled to prevent the spread of dust to occupied portions of the plant and to avoid creation of a nuisance in the surrounding area. Use of water will not be permitted when it will result in, or create, hazardous or objectionable conditions such as ice, flooding and pollution.

3.2 DISCONNECTION OF UTILITY SERVICES

A. Utilities shall be disconnected at the points indicated by the Owner or Engineer and left in a safe condition.

3.3 BURNING

A. The use of burning at the project site for the disposal of refuse and debris will not be permitted unless authorized in writing by the Owner.

3.4 PROTECTION OF EXISTING WORK

A. Existing work to remain shall be protected from damage. Work damaged by the Contractor shall be repaired to match existing work.

3.5 EXISTING BOOSTER PUMP STATION

A. Contractor shall remove the existing OCWD booster pump station whole and deliver to Oldham County Water District Office located at 2160 Spencer Ct., LaGrange KY, 40031.

B. Contractor shall notify and coordinate with OCWD prior to removing and delivering booster pump station.

END OF SECTION 024100

DIVISION 03

CONCRETE

SECTION 033000 – CAST-IN-PLACE CONCRETE

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment, and services required to furnish and install all cast-in-place concrete as indicated on the Drawings and specified herein.

B. All concrete construction shall conform to all applicable requirements of ACI 301 (latest), Specifications for Structural Concrete for Buildings, except as modified by the supplemental requirements specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork: Section 312000

1.3 SUBMITTALS

The Contractor shall submit the following data for Engineer review in accordance with Section 013323.

A. Concrete mixture proportions, test results, and curves plotted to establish water-cementitious materials ratio if ACI 301-05 Section 4.2.3.4.b is followed.

B. Proposed mix designs and all necessary substantiating data used to establish the proposed mix designs if ACI 301-05 Section 4.2.3.1 is followed.

C. Mix designs shall be submitted for all mixes proposed or required to be used, including all mixes containing admixtures.

D. A certified copy of the control records of the proposed production facility establishing the standard deviation as defined in Paragraph 4.2.3.2. of ACI 301.

E. Submit shop drawings as specified in ACI 301. Submit shop drawing showing the location of proposed construction and control joints separate from the steel reinforcement shop drawings.

1. Construction Joints
2. Control Joints
3. Steel Reinforcement

1.4 QUALITY ASSURANCE

The Contractor shall obtain and have available in the field office at all times, the following references:

A. ACI 301 Specifications for Structural Concrete for Buildings ACI 301 (latest Revision).

B. SP-15 (05) Field Reference Manual: Specifications for Structural Concrete for Buildings with selected ACI references.

Available from:

The American Concrete Institute
Publications Department
P.O. Box 9094
Farmington Hills, Michigan 48333-9094

C. Manual of Standard Practice - CRSI. (Latest Edition).

D. Placing Reinforcing Bars - CRSI (Latest Edition).

Available from:

Concrete Reinforcing Steel Institute
933 North Plum Grove Road
Schaumburg, Illinois 60173-4758

E. ACI 318-08 Building Code Requirements for Structural Concrete and Commentary.

F. ACI 347 Guide to Form Work for Concrete.

PART 2 - PRODUCTS

2.1 CLASSES OF CONCRETE AND USAGE

A. Structural concrete of the various classes required shall be proportioned by either Method 1 or Method 2 of ACI 301 to produce the following 28-day compressive strengths:

1. Selection of Proportions for Class A Concrete:

   a. 4,500 psi compressive for strength at 28 days.
   b. Type II cement plus supplementary cementitious materials.
   c. Max. water-cementitious materials ratio = 0.45.
   d. Min. cement content = 584 lbs.
   e. Nominal max. size coarse aggregate = No. 67 (3/4" max.) or No. 57 (1" max.). Walls with architectural treatment shall use No. 67 (3/4" max.).
   f. Air content = 6% plus or minus 1% by volume.
   g. Slump = 3" - 4" when tested in accordance with ASTM C 143/C 143M. Slump shall not exceed 8 inches when high-range water-reducers are used.

2. Selection of Proportions for Class B Concrete:

   a. 3,000 psi compressive strength at 28 days.
   b. Type I cement plus supplementary cementitious materials.
   c. Max. water-cementitious materials ratio = 0.45.
   d. Min. cement content = 470 lbs. (5.0 bags)/cu. yd. concrete.
   e. Nominal max. size coarse aggregate = No. 67 (3/4" max.) or No. 57 (1" max). Walls with architectural treatment shall use No. 67 (3/4" max.).
   f. Air content = 6% plus or minus 1% by volume.

g. Slump = 3" - 4" when tested in accordance with ASTM C 143/C 143M. Slump shall not exceed 8 inches when high-range water-reducers are used.

B. Concrete shall be used as follows:

1. Class A concrete for all concrete work except as noted below.
2. Class B concrete for fill concrete, thrust blocks and topping over hollow-core slabs, and where indicated on the Drawings.

C. Type II cement conforming to ASTM C 150 shall be used in all structural concrete. Cement for exposed to view concrete shall have a uniform color classification.

D. Coarse aggregate for concrete shall be size No. 57, as specified in ASTM C 33 unless a smaller size aggregate is required to conform to provisions of Section 4.2.2.3 of ACI 301. Coarse aggregate shall conform to all requirements of ASTM C 33.

E. Manufactured sand shall not be used as fine aggregate in concrete.

2.2 ADMIXTURES

A. An air entraining admixture shall be used on all concrete exposed to freezing and thawing cycles. Product shall be MB-AE 90, MB-VR or Micro Air by BASF Construction Chemicals or approved equal. A certification attesting to the percent of effective solids and compliance of the material with ASTM C 260 shall be furnished if requested.

B. Water-Reducing Admixture shall conform to ASTM C 494/C 494M Type A. Product shall be "Pozzolith" Series or "PolyHeed" Series by BASF Construction Chemicals or approved equal.

C. High-Range Water-Reducing Admixture shall conform to ASTM C 494/C 494M Type F. Product shall be Rheobuild 1000, "Glenium" Series or PS 1466 by BASF Construction Chemicals or approved equal.

D. Accelerating Admixture shall conform to ASTM C 494/C 494M Type C or E. Products shall be Pozzolith NC 534 or Pozzutec 20+ by BASF Construction Chemicals or approved equal.

E. Retarding Admixture shall conform to ASTM C 494/C 494M Type B or D. Product shall be "Pozzolith" Series or "DELVO" Series by BASF Construction Chemicals.

F. A water-reducing, set controlling admixture (nonlignin type) shall be used in all concrete. The admixture shall be a combination of polyhydroxylated polymers including catalysts and components to produce the required setting time based on job site conditions, specified early strength development, finishing characteristics required, and surface texture, as determined by the Engineer.

G. Certification shall be furnished attesting that the admixture exceeds the physical requirements of ASTM C 494, Type A, water-reducing and normal setting admixture, and when required, for ASTM C 494, Type D, water-reducing and retarding admixture when used with local materials with which the subject concrete is composed.

H. The admixture manufacturer, when requested, shall provide a qualified concrete technician employed by the manufacturer to assist in proportioning concrete for optimum use. He shall also be available when requested to advise on proper addition of the admixture to the concrete and on adjustment of the concrete mix proportions to meet changing job conditions.

I. The use of admixtures to retard setting of the concrete during hot weather, to accelerate setting during cold weather, and to reduce water content without impairing workability will be permitted if the following conditions are met:

J. The admixture shall conform to ASTM C494, except that the durability factor for concrete containing the admixture shall be at least 100 percent of control, the water content a maximum of 90 percent of control and length change shall not be greater than control, as defined in ASTM C 494.

K. Where the Contractor finds it impractical to employ fully the recommended procedures for hot weather concreting, the Engineer may at his discretion, require the use of a set retarding admixture for mass concrete 2.5 feet or more thick for all concrete whenever the temperature at the time concrete is cast exceeds 80oF. The admixture shall be selected by the Contractor subject to the review of the Engineer. The admixture and concrete containing the admixture shall meet all the requirements of these Specifications. Preliminary tests of this concrete shall be required at the Contractor's expense.

L. When more than one (1) admixture is used, all admixtures shall be compatible. They should preferably be by the same manufacturer.

M. Calcium chloride will not be permitted as an admixture in any concrete.

2.3 REINFORCEMENT

A. The minimum yield strength of the reinforcement shall be 60,000 pounds per square inch. Bar reinforcement shall conform to the requirements of ASTM A 615/A 615M. All bar reinforcement shall be deformed.

B. Wire-mesh reinforcement shall be continuous between expansion joints. Laps shall be at least one full mesh plus 2 inches, staggered to avoid continuous lap in either direction and securely wired or clipped with standard clips.

C. Smooth dowels shall be plain steel bars conforming to ASTM A 615/A615M, Grade 60, or steel pipe conforming to ASTM A 120, Schedule 80. Pipe, if used, shall be closed flush at each end with mortar or metal or plastic cap. Dowels shall be installed at right angles to construction joints and expansion joints. Dowels shall be accurately aligned parallel to the finished surface and shall be rigidly held in place and supported during placing of the concrete. One end of dowels shall be oiled or greased, or dowels shall be coated with high-density polyethylene with a minimum thickness of 14 mils.

D. Reinforcement supports and other accessories in contact with the forms for members which will be exposed to view in the finished work shall be of stainless steel or shall have approved high-density polyethylene tips so that the metal portion shall be at least 1/4 of an inch from the form or surface. Supports for reinforcement, when in contact with the ground or stone fill, shall be precast stone concrete blocks. Particular attention is directed to the requirement of Paragraph

3.3.2.4 of ACI Standard 301. These requirements apply to all reinforcement, whether in walls or other vertical elements, inclined elements or flatwork.

E. Particular care shall be taken to bend tie wire ends away from exposed faces of beams, slabs and columns. In no case shall ends of tie wires project toward or touch formwork.

2.4 OTHER MATERIALS

A. Anchorage items shall be of standard manufacture and of the type required to engage with the anchors to be installed therein under other sections of the Specifications and shall be subject to approval by the Engineer.

1. Slots shall be galvanized dovetail-type as specified in Section "Masonry Work".
2. Inserts shall be malleable iron or steel, and of sturdy design adequate strength for the load to be carried. All inserts shall be galvanized. Adjustable wedge inserts shall have an integral loop or strap at the back or shall be slotted to receive a special-headed bolt not smaller than 5/8-inch in diameter and of the required length and fitted with a hexagonal nut. Other inserts shall be either threaded or slotted as required by their usage. Threaded inserts shall have integral lugs to prevent running.
3. Concrete anchors shall be an approved expansion type conforming to Federal Specification FF-S-325, Groups I, II, III, or VIII, and shall be installed in strict accordance with the manufacturer's recommendations. Material for anchors shall be as specified in Section 05500 "Miscellaneous Metals". Anchors shall develop ultimate shear and pull-out loads of not less than the following values in Class A concrete:

Bolt Diameter (Inches)	Min. Shear (Pounds)	Min. Pull-Out Load (Pounds)
2	4,500	4,600
5/8	6,900	7,700
3/4	10,500	9,900

B. Epoxy bonding adhesive used to bond fresh plastic concrete to sound, hardened concrete shall meet the following Specification. The contractor shall furnish a notarized certification by the manufacturer that the proposed material meets the Specification.

1. Material:

The epoxy material shall consist of a 2-component system whose components conform to the following requirements:

a. Component A - Component A shall be a modified epoxy resin of the epichlorohydrin bisphenol A condensation type, containing suitable viscosity control agents and having an epoxide equivalent of 180-200.
b. Component B - The B component shall be primarily a reaction product of one mole of an aliphatic polyamine and two moles of mono-functional epoxide containing compounds modified with 2, 4, 6 tri (dimethylaminomethyl) phenol.
c. The component ratio of B to A by volume shall be as specified by the manufacturer.

2. Properties of Mixed Components:

a.	Solids Content	100% by weight
b.	Pot Life	25-35 min. @ 73°F.
c.	Tack-Free Time	4-5-1/2 hrs @ (Thin Film) 73°F.
d.	Final Cure ASTM D 695	3 days at 73°F. (75% ultimate strength)
e.	Initial Viscosity (A+B)	2,000 cps. min at 73°F.
f.	Color Mixed	Straw

3. Properties of Cured Material (Neat Material):

a.	Tensile Strength ASTM D 638	3,000 psi min. @ 14 days 73°F. cure
b.	Tensile Elongation ASTM D 638	2 - 2% at 14 modified days 73°F. cure
c.	Compressive Strength ASTM D 695	12,500 psi min. at 73° F. cure
d.	Compressive Modules ASTM D 695	470,000 psi min. @ 28 days, 73°F cure
e.	Compressive Strength ASTM D 695	5,500 psi min. @ 24 days 73°F cure
f.	Water Pick-up ASTM D 570	1.5 max.

C. Premolded expansion-joint filler strips shall conform to ASTM D 1752 and shall be 3/8-inch thick unless otherwise shown.

D. Joint sealants shall conform to ANSI A 116.1. The following joint sealants are acceptable:

1. Colma by Sika Chemical Corporation
2. Hornflex by A.C. Horn, Inc.
3. Sonolastic by BASF Construction Chemicals.

E. Nonshrink grout shall be Embeco 885 grout by BASF Construction Chemicals, Euco Firmix grout by the Euclid Chemical Company, or approved equal. The approved product shall be delivered to the site of the Work in the original sealed containers, each bearing the trade name of the material and the name of the manufacturer.

F. Hardeners and dustproofers shall be colorless, aqueous solution of zinc or magnesium fluosilicate. Each gallon of solution used for the first application shall contain not less than one pound of crystals. Each gallon of solution used for subsequent application shall contain not less than two pounds of crystals. Materials shall be reviewed by the Engineer. Product shall be Lapidolith by BASF Construction Chemicals or approved equal.

G. Porous fill shall be crushed rock or gravel of such size that all will pass a 1-1/2 inch screen and not more than 5 percent will pass a No. 4 screen, free from earth clay or other foreign substances.

H. Waterstops: Waterstops shall be polyvinyl chloride, flat dumbbell shape (no center bulb), of size shown on Drawings, complete with fittings as required such as unions, vertical tees, vertical ells, flat crosses, flat ells, flat tees, etc. Waterstops shall be securely wired into place to

maintain proper position during placement of fresh concrete, as shown on the Drawings. Care shall be taken in the installation of the waterstop and the placing of the concrete to avoid "folding" while concrete is being placed, and to prevent voids in the concrete surrounding the waterstop.

I. Form Liners: Form liners for construction of fluted wall treatment shall be prefabricated plastic liners as manufactured by Greenstreak Plastic Products, Interform Company, or Symons Corporation.

1. Liners shall be fiberglass or ABS (acrylonitrile - butadiene - styrene) of such configuration as to obtain the fluted pattern shown or indicated on the Drawings.
2. For purposes of designating type and quality of material required, form liners shall be pattern 361 trapezoidal liners as manufactured by Greenstreak Plastic Products.
3. Preparation of forming materials, sealing of joints to prevent grout leakage and form release treatment (if required) shall be in strict compliance with the manufacturer's printed instructions and recommendations.

PART 3 - EXECUTION

3.1 FINISHES

A. Exposed to Public View Concrete Surfaces:

1. All concrete exposed to view in the completed structure shall be produced using materials and workmanship to such a quality that only nominal finishing will be required. The provisions of paragraphs 6.2.2.1 and 6.3.6 of ACI 301 shall apply to all exterior exposed to public view concrete surfaces, including the outside surfaces of tanks.
2. Forms for exposed concrete surfaces shall be exterior grade, high-density overlay plywood, steel, or wood forms with smooth tempered hard-board form-liners.
3. Forms shall be coated with an approved release agent before initial pour and between subsequent pours, in accordance with the manufacturer's printed instructions. Form boards shall not be wet prior to placing concrete.
4. Recessed joints in concrete shall be formed using lacquer-coated wood battens or forms, milled to indicated profiles. Battens and corner strips shall be carefully inspected before concrete is placed and damaged pieces replaced.
5. Chamfer strips shall be one (1) inch radius with leg, polyvinyl chloride strips by Gateway Building Products, Saf-T-Grip Specialties Corp., Vinylex Corp., or equal.
6. Form panels shall be provided in the maximum size practicable in order to minimize form joints. Wherever practicable, form joints shall occur at recessed joints. All form joints in exterior exposed to view surfaces shall be carefully caulked with an approved nonstaining caulking compound. Joints shall not be taped. Form oil or other material which will impart a stain to the concrete shall not be allowed to contact concrete surfaces.
7. Care shall be taken to prevent chipping of corners or other damage to concrete when forms are removed. Exposed corners and other surfaces which may be damaged by ensuing operations shall be protected from damage by boxing, corner boards or other approved means until construction is completed.
8. Form ties shall remain in the walls and shall be equipped with a water seal to prevent passage of water through the walls. The minimum set back of form ties shall be 1-1/2 inches from faces of wall. The hole left by removal of tie ends shall be sealed and

grouted in accordance with the procedure described hereinafter in Par. 3.01.F. Form ties will be permitted to fall within as-cast areas of architecturally treated wall surfaces; this does not apply to walls receiving decorative waterproof masonry coating.

9. All formed exposed to view concrete surfaces shall have a "smooth rubbed finish". Exterior vertical surfaces shall be rubbed to one foot below grade. Interior exposed to public view vertical surfaces of liquid containers shall be rubbed to one (1) foot below the minimum liquid level that will occur during normal operations.

B. All vertical surfaces in liquid-containing structures shall have a "smooth form" finish.

1. All "smooth form" concrete vertical surfaces shall be a true plane within 1/4 inch in 10 feet as determined by a 10-foot straightedge placed anywhere on the surface in any direction. Abrupt irregularities shall not exceed 1/8 inch.

C. Basin, flume, conduit and tank floors shall have a "troweled" finish unless shown otherwise on Drawings.

D. Weirs and overflow surfaces shall be given a "troweled" finish.

E. Exterior platforms, steps and landings, shall be given a "broom" finish. "Broom" finish shall be applied to surfaces which have been steel-troweled to an even, smooth finish. The troweled surface shall then be broomed with a fiber-bristle brush in the direction transverse to that of the main traffic.

F. Patching of holes due to removal of tie ends and other repairable defective areas, shall be as follows: Entire contact area of hole shall be coated with two-part moisture insensitive epoxy bonding compound as specified in Par. 2.04.B. in accordance with manufacturer's specifications, and prior to placing of freshly mixed patching mortar. Parching mortar shall be mixed and placed in general accordance with ACI 301, Par. 5.3.7.5.

G. For floors and slabs in which drains occur, special care shall be exercised to slope the floors uniformly to the drains. All floors with drains shall be sloped not less than 1/8 inch per foot unless otherwise shown. In all areas where quarry tile or other materials requiring more than 1/4 inch drop are to be overlaid, the concrete base slab shall be depressed to provide a finished floor at the same elevation as surrounding areas.

3.2 TESTING

A. All testing shall be in accordance with provisions of ACI 301. Testing services listed in ACI Sections 1.6.4 shall be performed by a testing agency acceptable to the Engineer and Owner.

B. The testing services of ACI sections 1.6.4.2 and 1.6.4.3 shall be performed at the Contractor's expense. The Owner-approved third-party testing agency shall be responsible for making concrete test cylinders, storing and protecting concrete cylinders, and delivering cylinders to the Owner-approved testing laboratory.

C. Testing services of ACI Section 1.6.4.4 shall be paid for by the Contractor. Test shall be made for each 50 cubic yards of concrete and/or each day concrete is placed.

3.3 ADDITIONAL REQUIREMENTS

A. Unless otherwise directed by the Engineer, the vertical surfaces of footings shall be formed. Excavations and reinforcement for all footings shall have been inspected by the Engineer before any concrete is placed.

B. The installation of underground and embedded items shall be inspected before slabs are placed. Pipes and conduits shall be installed below the concrete unless otherwise indicated. The fill required to raise the subgrade shall be placed as specified in Section 312000 "Earthwork". Porous fill not less than 6 inches in compacted thickness shall be installed under all slabs, tank bottoms, and foundations. The fill shall be leveled and uniformly compacted to a reasonably true and even surface. The surfaces shall be clean, free from frost, ice, mud and water. Waterproof paper, polyethylene sheeting of nominal 4-mil minimum thickness, or polyethylene-coated burlap shall be laid over all surfaces receiving concrete.

C. Concrete shall be placed in layers not over 18 inches deep and each layer shall be compacted by mechanical internal-vibrating equipment supplemented by hand spading, rodding and tamping as directed. Vibrators shall not be inserted into lower courses that have begun to set.

D. Concrete Mixing

1. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M and furnish batch ticket information.

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

2. Project site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

    a. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at lease 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
    b. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd.
    c. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

E. If concrete is placed by pumping, no aluminum shall be used in any parts of the pumping system which contact or might contaminate the concrete. Aluminum chutes and conveyors shall not be used.

F. All concrete surfaces shall be moist cured by the application of absorptive mats or double thicknesses of fabric kept continuously wet. Forms shall be kept continuously wet. Use of other curing methods will not be permitted unless written authorization is received from the Engineer.

G. The unit of operation shall not exceed 30 feet for tank walls and walls exposed to weather, and 45 feet for other work in any horizontal direction and not less than 48 hours shall elapse between casting of adjoining units unless these requirements are waived by the Engineer. Provision shall be made for jointing successive units as indicated or required to be made at spacing of approximately 25 feet. Additional construction joints required to satisfy the 25-foot spacing shall be located by the Contractor subject to the review of the Engineer. The Contractor shall submit for review drawings separate from the steel reinforcing drawings, showing the location of all proposed construction joints. All construction joints shall be prepared for bonding by roughening the surface of the concrete in an acceptable manner which will expose the aggregate uniformly and will not leave laitance, loosened particles of aggregate or damaged concrete at the surface. Joints in walls and columns shall be maintained level. Concrete shall be placed in layers not over 18 inches deep and each layer shall be compacted by mechanical internal-vibrating equipment supplemented by hand spading, rodding and tamping as directed. Vibrators shall not be inserted into lower courses that have begun to set.

H. Formwork for beam soffits and slabs and other parts that support the weight of concrete, shall remain in place until the concrete has reached its specified 28-day strength, unless otherwise specified or permitted.

I. Concrete Walks and Curbs:

1. Subgrade shall be true and well compacted at the required grades. Spongy and otherwise unsuitable material shall have been removed and replaced with approved material. Concrete walks shall be placed upon porous fill covered with waterproof paper, polyethylene sheeting of nominal 4-mil minimum thickness or polyethylene-coated burlap.
2. Concrete walks shall be not less than 4 inches in thickness. Walks shall have contraction joints every 5 linear feet in each groove in the top surface of the slab to a depth of at least one-fourth the slab thickness with a jointing tool. Transverse expansion joints shall be installed at all returns, driveways, and opposite expansion joints in adjacent curbs. Where curbs are not adjacent, transverse expansion joints shall be installed at intervals of approximately forty (40) feet. Sidewalks shall receive a "broomed" finish. Scoring shall be in a transverse direction. Edges of the sidewalks and joints shall be edged with a tool having a radius not greater than 1/6 inch. Sidewalks adjacent to curbs shall have a slope of 1/4 inch per foot toward the curb. Sidewalks not adjacent to curbs shall have a slope of 1/4 inch per foot. The surface of the concrete shall show no variation in cross section in excess of 1/4 inch in 5 feet. Concrete walks shall be reinforced with 6 x 6-W1.4xW1.4 welded wire reinforcement.
3. Concrete curbs shall be constructed to the section indicated on the Standard Detail, and all horizontal and vertical curves shall be incorporated as indicated or required. Forms shall be steel as approved by the Engineer. At the option of the Contractor, the curbs may be precast or cast-in-place. Cast-in-place curbs shall be divided into sections 8 to 10 feet in length using steel divider plates. The divider plates shall extend completely through the concrete and shall be removed. Precast curbs shall be cast in lengths of 4 to 5 feet. All exposed surfaces of concrete shall be finished smooth. All sharp edges and the edges of joints and divisions shall be tooled to 1/4 inch radius. Steel reinforcement shall be installed where the curb crosses pipe trenches or other insecure foundations. Such reinforcement shall consist of two (2) No. 4 deformed bars near the bottom of the curb and shall extend at least 24 inches beyond the insecure area. Transverse expansion joints shall be installed at all curb returns and at intervals of approximately 40 feet.

J. Column base plates, bearing plates for beams and similar structural members, machinery and equipment bases shall, after being plumbed and properly positioned, be provided with full bearing with nonshrink grout. Concrete surfaces shall be rough, clean, free of oil, grease, and laitance and shall be moistened thoroughly immediately before grout is placed. Metal surfaces shall be clean and free of oil, grease and rust. Mixing and placing shall be in conformance with the material manufacturer's printed instructions. After the grout has set, exposed surfaces shall be cut back one (1) inch and covered with a parge coat of mortar consisting of one (1) part Portland cement, two (2) parts sand and sufficient water to make the mixture placeable. Parge coat shall have a smooth dense finish. Exposed surfaces of grout and parge coat shall be water cured with wet burlap for seven (7) days.

K. Grout fill which is formed in place by using rotating equipment as a screen, such as clarifiers and similar types of equipment, shall be mixed in proportions and consistencies as required by the manufacturer or supplier of the equipment.

L. Watertightness:

1. The structures which are intended to contain liquids and/or will be subjected to exterior hydrostatic pressures shall be so constructed that, when completed and tested, there shall be no loss of water, and no wet spots shall show.
2. As soon as practicable, after the completion of the structures, the Contractor shall fill them with water and if leakages develop or wet spots show, the Contractor shall empty such structures and correct the leakage in an approved manner. Any cracks which appear in the concrete shall be dug out and suitably repaired. Temporary bulkheads over pipe openings in walls shall be provided as required for the testing.
3. After repairs, if any are required, the structures shall be tested again and further repaired, if necessary, until satisfactory results are obtained. All work in connection with these tests and repairs shall be at the expense of the Contractor.
4. Waterstops shall be placed in other locations as indicated on the Drawings and as may be required to assure the watertightness of all containers of liquids. Special shop-fabricated ells, tees, and crosses shall be provided at junctions. Waterstops shall be extended at least 6 inches beyond end of placement in order to provide splice length for subsequent placement. In slabs and tank bottoms, water stops shall be turned up to be made continuous with waterstops at bottom of walls or in walls.
5. Joints between pipe (except cast iron wall pipe) and cast-in-place concrete walls shall be sealed by means of a groove cast completely around the pipe; the groove shall be filled with a quick setting hydraulic compound similar and equal to "Master Seal 590" as made by BASF Construction Chemicals mixed and applied by the manufacturer's instructions.

M. Unless otherwise shown or directed, all pumps, other equipment, and items such as lockers, motor control centers and the like, shall be installed on concrete bases. The bases shall be constructed to the dimensions shown on the plans or as required to meet plan elevations. Where no specific plan elevations are required, the bases shall be 6 inches thick and shall extend 3 inches outside the metal equipment base. In general, the concrete bases shall be placed up to 2 inches below the metal base. The equipment shall then be properly shimmied to grade and the 2- inch void filled with nonshrink grout.

N. Concrete which, in the opinion of the Architect-Engineer, has excessive honeycomb, aggregate pockets or depressions will be rejected and the Contractor shall, at his own expense, remove the entire section containing such defects and replace it with acceptable concrete.

O. Manhole or access steps shall be plastic, constructed of copolymer polypropylene meeting the requirements of ASTM D 2146 for Type II, Grade 16906 material. Step shall be reinforced with ASTM A 615, Grade 60, #4 deformed steel reinforcing bar, be 9 inches deep, 14 inches wide, provided with notched tread ridge, foot retainer lugs on each side of tread and penetration stops for press fit installation. Plastic steps shall be PS2-PF as manufactured by M.A. industries, Inc., Peachtree City, Georgia. Steps shall be installed by drilling 1 inch diameter holes, minimum 3-3/4 inches deep into the wall, and then driving steps into hole to the penetration stop, resulting in a press fit condition.

P. Tank pressure relief valves shall be 6 inches diameter Neenah Foundry Company R-5001-1, American Valve & Hydrant B315.1, or equal, floor type, with outside hooks or inside self-contained lock; quantity and spacing as shown on structural drawings. No part of pressure relief valves shall project above the neat line of the tank floor to prevent fouling of scraper mechanisms where used.

Q. All existing contact surfaces with new patch shall be coated with moisture-insensitive epoxy bonding adhesive, Sikadur Hi-Mod, Concresive LPL Liquid by BASF Construction Chemicals, or approved equal. Patch shall consist of base pour of 4,000 psi structural concrete, then a topping of non-shrink natural aggregate grout, Masterflow 713, Sonogrout by BASF Construction Chemicals, or approved equal, mixed and placed in accordance with manufacturer's instructions, to the thicknesses shown on Drawings. Coat base pour with epoxy bonding adhesive prior to placing grout course.

END OF SECTION 033000

DIVISION 31

EARTHWORK

SECTION 312000 – EARTHWORK

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all materials, labor, equipment, and services necessary to do all clearing and grubbing, excavation, backfilling, providing of additional fill material and topsoil, control of surface drainage and groundwater, finished site grading, and erosion control required to construct the work as shown.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. State and local code requirements shall control the disposal of trees and shrubs.

B. All burning shall be controlled by applicable local regulations.

C. Excavation Support and Protection - Section 315000

D. Erosion and Sedimentation Control - Section 312500

1.3 JOB CONDITIONS

A. Weather: Earthwork operations shall be suspended at any time when satisfactory results cannot be obtained on account of rain, snow, ice, drought or other adverse weather conditions.

B. Existing Utilities: Prior to the commencement of work, the Contractor shall locate existing underground utilities in areas of the work. If utilities are to remain in place, provide adequate means of protection during earthwork operations.

C. Use of Explosives: The Contractor (or any of his Subcontractors) shall not bring explosives onto site or use in work without prior written permission from the Owner. All activities involving explosives shall be in compliance with the rules and regulations of the State Department of Mines, and Minerals, Division of Explosives and Blasting. The contractor is solely responsible for handling, storage, and use of explosive materials when their use is permitted.

D. Protection of Persons and Property:

1. Barricade open excavations occurring as part of this work and post with warning lights.

    a. Operate warning lights as recommended by authorities having jurisdiction.
    b. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.

E. Dust Control: Use all means necessary to control dust on or near the project site where such dust is caused by the Contractor's operations or directly results from conditions left by the Contractor.

1.4 UTILITY LINE ACTIVITIES COVERED UNDER NATIONWIDE PERMIT # 12

All activities involving utility line construction covered under NATIONWIDE PERMIT # 12 shall meet the following conditions:

A. The general Water Quality Certification is limited to the crossing of intermittent and perennial streams by utility lines.

B. The construction of permanent or temporary access roads will impact less than 300 linear feet of intermittent and perennial streams and less than one acre of jurisdictional wetlands.

C. Utility lines shall be located at least 50 feet away from a stream which appears as a blue line on a USGA 7-1/2 minute topographic map except where the utility line alignment crosses the stream. Utility lines that cross streams shall be constructed by methods that maintain normal stream flow and allow for dry excavation. Water pumped from the excavation shall be contained and allowed to settle prior to re-entering the stream. Excavation equipment and vehicles shall operate outside of the flowing portion of the stream. Spoil material from the utility line excavation shall not be allowed to enter the flowing portion of the stream.

D. The activities shall not result in any permanent changes in preconstruction elevation contours in waters or wetlands or stream dimension, pattern or profile.

E. Utility line construction projects through jurisdictional wetlands shall not result in conversion of the area to non-wetland status.

F. Measures shall be taken to prevent or control spills of fuels, lubricants, or other toxic materials used in construction from entering the watercourse.

G. Removal of riparian vegetation in the utility line right-of-way shall be limited to that necessary for equipment access. Effective erosion and sedimentation control measures must be employed at all times during the project to prevent degradation of waters of the Commonwealth. Site regarding and reseeding will be accomplished within 14 days after disturbance.

H. To the maximum extent practicable, all-in stream work under this certification shall be performed during low flow.

I. Heavy equipment, e.g. bulldozers, backhoes, draglines, etc., if required for this project, should not be used or operated within the stream channel. In those instances where such in stream work is unavoidable, then it shall be performed in such a manner and duration as to minimize turbidity and disturbance to substrates and bank or riparian vegetation.

J. Any fill shall be of such composition that it will not adversely affect the biological, chemical, or physical properties of the receiving waters and/or cause violations of water quality standards. If riprap is utilized, it is to be of such weight and size that bank stress or slump conditions will not be created because of its placement.

K. Removal of existing riparian vegetation should be restricted to the minimum necessary for project construction.

L. Should evidence of stream pollution or jurisdictional wetland impairment and/or violations of water quality standards occur as a result of this activity (either from a spill or other forms of water pollution), the Kentucky Division of Water shall be notified immediately by calling 800/928-2380.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. Definitions:

1. Satisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups GW, GP, GM, SM, SW, SP, GC, SC, ML, and CL.
2. Unsatisfactory soil materials are defined as those complying with ASTM D2487 soil classification groups MH, CH, OL, OH and PT. The Contractor shall notify the Engineer if these soil materials are encountered.
3. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, crushed slag, natural or crushed sand.
4. Drainage Fill: Washed, evenly graded mixture of crushed stone, or uncrushed gravel, with 100 percent passing a 1/2-inch sieve and not more than 5 percent passing a No. 4 sieve.
5. Backfill and Fill Materials: Satisfactory soil materials free of debris, waste, frozen materials, vegetation, and other deleterious matter.

PART 3 - EXECUTION

3.1 CLEARING AND GRUBBING

A. Work shall consist of cutting and removing designated trees, stumps, brush, logs, removal of fences, or other loose and projecting material. Unless otherwise specified, it shall also include the grubbing of stumps, roots, and other natural obstructions which, in the opinion of the Engineer, must be removed to execute properly the construction work and operate properly the facility upon the completion of construction.

B. Trees, bushes, and all-natural vegetation shall only be removed with the approval of the Engineer. No cleared or grubbed materials shall be used in backfills or embankment fills. All stumps, roots, and other objectionable material shall be grubbed up so that no roots larger than 3 inches in diameter remain less than 18 inches below the ground surface. All holes and depressions left by grubbing operations shall be filled with suitable material and compacted to grade, as recommended in Paragraph 3.06.

C. Disposal shall be by burning or other methods satisfactory to the Engineer; however, burning will be permitted only when the Contractor has obtained written permission from the local regulatory agency.

D. The Contractor shall also remove from the site and satisfactorily dispose of all miscellaneous rubbish including, but not limited to, masonry, scrap metal, rock, pavement, etc., that is under the fill or to be removed as shown on the Drawings, specified herein, or directed by the Engineer.

E. Existing improvements, adjacent property, utility and other facilities, and trees, plants, and brush that are not to be removed shall be protected from injury or damage resulting from the Contractor's operations.

F. Trees and shrubs, designated to remain or that are beyond the clearing and grubbing limit, which are injured or damaged during construction operations shall be treated or replaced at the Contractor's expense by experienced tree surgery personnel.

3.2 EROSION CONTROL

A. Temporary measures shall be applied throughout the construction period to control and to minimize siltation to adjacent properties and waterways. Such measures shall include, but not be limited to, the use of berms, silt barriers, gravel or crushed stone, mulch, slope drains and other methods.

B. These temporary measures shall be applied to erodible material exposed by any activity associated with the construction of this project.

C. Refer to Section 312500, Erosion and Sedimentation Control for requirements.

3.3 EXCAVATION

A. Excavation of every description and of whatever substances encountered within the grading limits of the project shall be performed to the lines and grades indicated on the Drawings. All excavation shall be performed in the manner and sequence as required for the work.

B. All excavated materials that meet the requirements for fill, subgrades or backfill shall be stockpiled within the site for use as fill or backfill, or for providing the final site grades. Where practicable, suitable excavated material shall be transported directly to any place in the fill areas within the limits of the work. All excavated materials that are not suitable for fill and any surplus of excavated material that is not required for fill shall be disposed of by the Contractor.

C. The site shall be kept free of surface water at all times. The Contractor shall install drainage ditches, dikes and shall perform all pumping and other work necessary to divert or remove rainfall and all other accumulations of surface water from the excavations. The diversion and removal of surface water shall be performed in a manner that will prevent flooding and/or damage to other locations within the construction area where it may be detrimental. The Contractor shall provide, install, and operate sufficient trenches, sumps, pumps, hose piping, well points, deep wells, etc., necessary to depress and maintain the groundwater level at least 2 feet below the base of the excavation during all stages of construction operations. The groundwater table shall be lowered in advance of excavation and maintained a minimum of 2 feet below the lowest excavation subgrade made until the excavation is backfilled or the structure has sufficient strength and weight to withstand horizontal and vertical soil and water pressures from natural groundwater.

D. Excavations for concrete structural slabs on grade shall extend 2 feet below the indicated bottom of slabs. The over-excavation shall be backfilled with 18 inches, compacted thickness, of over lot fill material or suitable material as herein specified. The remaining 6 inches of over-excavation shall be backfilled with porous fill material. The porous fill layer shall extend beyond the limits of the concrete slab a minimum of 2 feet on all sides as indicated on the Drawings. The porous fill shall be crushed stone or gravel and shall have the following U.S. Standard Sieve gradation:

Sieve	1-1/2	1	3/4	1/2	3/8
% Passing	Min 100	95±5	58±17	Max 15	Max 5

E. Excavations for the construction shall be carefully made to the depths required. Bottoms for footings and grade beams shall be level, clean and clear of loose material, the lower sections true to size. Bottoms of footings and grade beams, in all locations, shall be at a minimum depth of 30 inches below adjacent exterior finished grade or 30 inches below adjacent existing grade, whichever is lower, whether so indicated or not. Footings and grade beam bottoms shall be inspected by the Engineer before any concrete is placed thereon.

F. In excavations for structures where, in the opinion of the Engineer, the ground is spongy or otherwise unsuitable for the contemplated foundation, the Contractor shall remove such unsuitable material and replace it with suitable material properly compacted.

G. Sheeting and shoring shall be provided as necessary for the protection of the work and for the safety of the personnel. The clearances and types of the temporary structures, insofar as they affect the character of the finished work, will be subject to the review of the Engineer, but the Contractor shall be responsible for the adequacy of all sheeting, bracing and cofferdamming. All shoring, bracing and sheeting shall be removed as the excavations are backfilled in a manner such as to prevent injurious caving; or, if so, directed by the Engineer, shall be left in place. Sheeting left in place shall be cut off 18 inches below the surface.

H. Excavation for structures which have been carried below the depths indicated without specific instructions shall be refilled to the proper grade with suitable material properly compacted, except that in excavation for columns, walls or footings, the concrete footings shall extend to this lower depth. All work of this nature shall be at the Contractor's expense.

3.4 FILL

A. All existing fill below structures and paved areas must be stripped. The upper six (6) inches of the natural subgrade below shall be scarified and recompacted at optimum moisture to at least ninety-five percent (95%) of Standard Proctor Density ASTM D 698 (latest revision).

B. All vegetation, such as roots, brush, heavy sods, heavy growth of grass and all decayed vegetable matter, rubbish and other unsuitable material within the area upon which fill is to be placed shall be stripped or otherwise removed before the fill is started. In no case will such objectionable material be allowed to remain in or under the fill area. Existing fill from excavated areas on site shall be used as fill for open and/or planted areas. Additional fill stockpiled at the site can be used for structural fill if approved by the Engineer. Any additional material necessary for establishing the indicated grades shall be furnished by the Contractor and approved by the Engineer. All fill material shall be free from trash, roots, and other organic material. The best material to be used in fills shall be reserved for backfilling pipelines and for

finishing and dressing the surface. Material larger than 3 inches maximum dimension shall not be permitted in the upper 6 inches of the fill area. Fill material shall be placed in successive layers and thoroughly tamped or rolled in a manner approved by the Engineer, each layer being moistened or dried such that the specified degree of compaction shall be obtained. No fill shall be placed or compacted in a frozen condition or on top of frozen material. No fill material shall be placed when free water is standing on the surface of the area where the fill is to be placed and no compaction of fill will be permitted with free water on any point of the surface of the fill to be compacted.

C. Where concrete slabs are placed on earth, all loam and organic or other unsuitable material shall be removed. Where fill is required to raise the subgrade for concrete slabs to the elevations as indicated on the Drawings or as required by the Engineer, such fill shall consist of suitable material and shall be placed in layers. Each layer shall be moistened or dried such that the specified degree of compaction shall be obtained. All compaction shall be accomplished in a manner and with equipment as approved by the Engineer. When the subgrade is part fill and part excavation or natural ground, the excavated or natural ground portion shall be scarified to a depth of 12 inches and compacted as specified for adjacent fill.

3.5 BACKFILLING

A. After completion of footings, grade beams, and other construction below the elevation of the final grades and prior to backfilling, all forms shall be removed, and the excavation shall be cleaned of all trash and debris. Material for backfilling shall be as specified for suitable material, placed and compacted as specified hereinafter. Backfill shall be placed in horizontal layers of the thickness specified and shall have a moisture content such that the required degree of compaction is obtained. Each layer shall be compacted by mechanical tampers or by other suitable equipment approved by the Engineer to the specified density. Special care shall be taken to prevent wedging action or eccentric loading upon or against the structure. Trucks and machinery used for grading shall not be allowed within 45 degrees above the bottom of the footings or grade beams.

B. The trenches shall be backfilled following visual inspection by the Engineer and prior to pressure testing. The trenches shall be carefully backfilled with the excavated materials approved for backfilling, or other suitable materials, free from large clods of earth or stones. Each layer shall be compacted to a density at least equal to that of the surrounding earth and in such a manner as to permit the rolling and compaction of the filled trench with the adjoining earth to provide the required bearing value, so that paving, if required, can proceed immediately after backfilling is completed.

3.6 COMPACTION

A. Suitable material as hereinbefore specified shall be placed in maximum 8-inch horizontal layers. Compaction shall be performed by rolling with approved tamping rollers, pneumatic-tired rollers, three-wheel power rollers or other approved equipment. The degree of compaction required is expressed as a percentage of the maximum dry density obtained by the test procedure presented in ASTM D-698. Laboratory moisture density tests shall be performed on all fill material. Material shall be moistened or aerated as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction. Compaction requirements shall be as specified below:

Fill Utilized For	Required Density (%)	Maximum Permissible Lift Thickness As Compacted, Inches
Backfill & Utility Trenches Under Foundations & Pavements	95-100	8
Backfill Around Structures	95-100	8
Field and Utility Trench Backfill Under Sidewalks and Open Areas	90-100	8

B. Field density tests shall be performed in sufficient number to ensure that the specified density is being obtained. Tests shall be in accordance with ASTM Standards D 1556 or D 2922/D 3017 and shall be performed as authorized by the Engineer. Payment for field density tests shall be by the Contractor. Contractor shall provide suitable notification for coordination of testing. Delays due to the lack of adequate advance notification shall be the responsibility of the Contractor.

3.7 SITE GRADING

A. Where indicated or directed, topsoil shall be removed without contamination with subsoil and spread on areas already graded and prepared for topsoil, or transported and stockpiled convenient to areas for later application, or at locations specified. Topsoil shall be stripped to full depth and, when stored, shall be kept separate from other excavated materials and piled free of roots, stones, and other undesirable materials.

B. Following stripping, fill areas shall be scarified to a minimum depth of six (6) inches to provide bond between existing ground and the fill material. Material should be placed in successive horizontal layers not exceeding twelve (12) inches uncompacted thickness. In general, layers shall be placed approximately parallel to the finished grade line.

C. In general, and unless otherwise specified, the Contractor may use any type of earth moving equipment he has at his disposal, provided such equipment is in satisfactory condition and of such type and capacity that the work may be accomplished properly and the grading schedule maintained. During construction, the Contractor shall route equipment at all times, both when loaded and empty, over the layers as they are placed, and shall distribute the travel evenly over the entire area.

D. The material in the layers shall be of the proper moisture content before rolling or tamping to obtain the prescribed compaction. Wetting or drying throughout the layer shall be required. Should the material be too wet to permit proper compaction or rolling, all work on the fill thus affected shall be delayed until the material has dried to the required moisture content. If the material is too dry, it shall be sprinkled with water and manipulated to obtain the uniform moisture content required throughout a layer before it is compacted.

E. Each layer of the fill shall be compacted by rolling or tamping to the standard specified in Paragraph 3.06 and not less than 90% maximum density at optimum moisture content as determined by field density tests made by the Standard Proctor method. In general, and unless otherwise specified, the Contractor may use any type of compaction equipment such as

sheepsfoot rollers, pneumatic rollers, smooth rollers and other such equipment he has at his disposal, provided such equipment is in satisfactory condition and is of such design, type, size, weight, and quantity to obtain the required density in the embankment. If at any time the required density is not being obtained with the equipment then in use by the Contractor, the Engineer may require that different and/or additional compaction equipment be obtained and placed in use at once to obtain the required compaction.

F. The Contractor shall be responsible for the stability of all embankments and shall replace any portion which, in the opinion of the Engineer, has become displaced due to carelessness or negligence on the part of the Contractor.

3.8 TOPSOIL

A. Provide all labor, materials, equipment and services required for furnishing and placing topsoil. Samples of topsoil shall be submitted to the Engineer for review before topsoil is placed. The material shall be good quality loam and shall be fertile, friable, mellow; free from stones larger than one (1) inch, excessive gravel, junk metal, glass, wood, plastic articles, roots and shall have a liberal amount of organic matter. Light sand loam or heavy clay loam will not be acceptable.

B. The topsoil shall be 3 inches thick in all areas to be seeded. No topsoil shall be placed until the area to be covered is excavated or filled to the required grade. Imported backfill material will be stockpiled on-site for structure backfilling and top soiling.

END OF SECTION 312000

SECTION 312319 – DEWATERING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor and equipment required to dewater all excavations.

B. Dewatering of all excavations shall be the responsibility of the Contractor, and no additional compensation will be allowed for same unless specifically included as a bid item.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork is included in Section 312000.

B. Erosion and Sedimentation Control is included in Section 312500.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 GENERAL

A. Dewatering equipment shall be of adequate size and quantity to ensure maintaining proper conditions for installing pipe, concrete, backfill or other material or structure in the excavation.

B. Dewatering shall include proper removal of any and all liquid, regardless of its source, from the excavation and the use of all practical means available to prevent surface runoff from entering any excavation.

C. The site shall be kept free of surface water at all times. The Contractor shall install drainage ditches, dikes and shall perform all pumping and other work necessary to divert or remove rainfall and all other accumulations of surface water from the excavations. The diversion and removal of surface water shall be performed in a manner that will prevent flooding and/or damage to other locations within the construction area where it may be detrimental. The Contractor shall provide, install and operate sufficient trenches, sumps, pumps, hose piping, well points, deep wells, etc., necessary to depress and maintain the groundwater level at least two (2) feet below the base of the excavation during all stages of construction operations. The ground water table shall be lowered in advance of excavation and maintained a minimum of two (2) feet below the lowest excavation subgrade made until the structure has sufficient strength and weight to withstand horizontal and vertical soil and water pressures from natural groundwater.

D. Dewatering operations should not discharge into the sanitary sewer system, or into any ditch, pipe or other conveyance that leads to a regulated water body, except as authorized by a KPDES permit.

END OF SECTION 312319

SECTION 312500 – EROSION AND SEDIMENTATION CONTROL (Areas Less Than One Acre)

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Furnish all labor, materials, and equipment required for erecting, maintaining and removing temporary erosion and sedimentation controls as shown on the Drawings and as specified herein and as recommended by state and local regulatory agencies.

B. Temporary erosion controls include, but are not limited to grassing, mulching, seeding, providing erosion control and turf reinforcement mats on all disturbed surfaces including waste area surfaces and stockpile and borrow area surfaces; scheduling work to minimize erosion and providing interceptor ditches at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits.

C. Temporary sedimentation controls include, but are not limited to, silt dams, traps, barriers, and appurtenances on sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits.

D. Contractor is responsible for providing and maintaining effective temporary erosion and sediment control measures prior to and during construction or until final controls become effective.

E. The Contractor shall be responsible for placement of erosion and sedimentation controls. Prior to construction, the Contractor shall develop an erosion control plan and submit to the Engineer for review. Prior to excavation, fill or grade work, the Contractor shall place controls in locations required by the erosion control plan. If during the course of construction, the Engineer determines additional controls are required, the Contractor shall furnish, install and maintain additional mulching, blankets and/or sediment barriers to control erosion and sedimentation to the satisfaction of the Engineer.

F. The Contractor shall notify the appropriate state agency before beginning construction and shall implement erosion control measures as may be required by state and federal agencies. If disturbed area is greater than one acre, Contractor shall submit a signed Notice of Intent form to the Division of Water at least 48 hours prior to beginning of construction activity.

G. The Contractor shall inspect and repair all erosion and sedimentation controls every seven (7) days and after each rainfall of 0.5 inch or greater.

H. Bare soil areas must be seeded, mulched, or covered after 14 days if no work will be done in the area within the next 7 days.

1.2 RELATED WORK

A. Dewatering is included in this Division, Section 312319.

B. Final erosion protection measures where required are included in this Section.

C. Utility Line Stream Crossings - Division 2

PART 2 – PRODUCTS

2.1 SEED

A. The seed mixture to be sown shall be in the following proportions:

Common Name	Proportion By Weight	% of Purity	% of Germination
Fine Lawn Fescue	40	90	85
Chewings Fescue	25	90	85
Italian Rye Grass	20	90	85
Red Top	10	90	85
White Clover	5	95	90

B. All seed shall be fresh and clean and shall be delivered mixed, in unopened packages, bearing a guaranteed analysis of the seed mixture.

2.2 FERTILIZER

A. Just prior to the planting of turf, evenly broadcast 15 pounds per thousand square feet of fertilizer, 10-10-10 (nitrogen, phosphorus, potassium). Disc or harrow fertilizer 2 to 4 inches into the soil.

B. Fertilizer shall be delivered to the site in the original unopened container bearing the manufacturer's guarantee analysis. Any fertilizer that becomes caked or damaged making it unsuitable for use, will not be accepted.

2.3 SOD

A. Sod shall be at least 70% Bluegrass, strongly rooted, and free of weeds.

B. It shall be mowed to a height not to exceed 3 inches before lifting and shall be of uniform thickness not over 1-1/2 inches of soil.

2.4 MULCH

A. Mulch for seeded areas shall be Conwed Hydro Mulch, Silva-Fiber, or equal. It shall be suitable for use in a water slurry or for application with hydraulic equipment.

B. Clean straw is acceptable as mulch. It shall be spread at the rate of one (1) bale per 1,000 feet (approximately 2-inch loose depth).

C. Mulch on slopes at or greater than 3:1 shall be held in place with turf reinforcement mat.

D. Mulch on areas subject to surface water run-off or in drainage ditches shall be held in place with turf reinforcement mat.

2.5 EROSION CONTROL BLANKETS

A. Erosion Control Blanket shall be made up of biodegradable and/or photodegradable products such as jute, wood fiber, coconut fiber, straw and degradable plastic netting. They shall degrade at a rate of approximately 6 months to 24 months.

B. Erosion Control Blanket shall be installed on slopes less than 3:1.

2.6 TURF REINFORCEMENT MAT

A. Where indicated on the Contract Drawings or as described in the Specifications, in all ditches and drainage channels and on all slopes equal to or greater than 3:1, Turf Reinforcement Mat shall be installed for long-term erosion control.

B. Turf Reinforcement Mat shall consist of top- and bottom-heavy weight netting and biodegradable matrix such as coconut fiber or aspen curled wood excelsior, as manufactured by Western Excelsior Excel PP5-8 Turf Reinforcement Mat or equal. Product shall degrade at a minimum rate of 36 months.

C. Where slope and hydraulic conditions are severe, a synthetic matrix may be used, based on manufacturer's recommendations.

2.7 SILT FENCE

A. Temporary Silt Fence shall consist of woven geotextile fabric attached to 2" X 2" X 48" tall hardwood stakes.

1. Exposed Fabric shall be 36 inches and a minimum of 4 inches shall be buried in trench as shown on the Detail Drawings.
2. Stakes shall be at 6' centers unless stated otherwise on Contract Documents.

B. Temporary Reinforced Silt Fence

1. For areas of steep slopes and high flows, where indicated on the Contract Drawings, or as directed by state or local regulations, Reinforced Silt Fence shall be installed.
2. Fabric shall be woven monofilament geotextile attached to 11-gauge steel fencing of 2" X 4" grid.
3. Stakes shall be 5 feet tall steel and shall be installed on 4 feet centers.
4. Fabric and fencing shall be buried in trench as shown on the Detail Drawings.

C. Spacing of Silt Fences on slopes shall be according to the following table, or as directed by state or local regulatory agencies:

Slope Angle	Soil Type		
	Silty	Clays	Sandy
Very Steep (1:1)	50 ft.	75 ft.	100 ft.
Steep (2:1)	75 ft.	100 ft.	125 ft.
Moderate (4:1)	100 ft.	125 ft.	150 ft.
Slight (10:1)	125 ft.	150 ft.	200 ft.

D. If runoff flows along the uphill side of the silt fence, Contractor shall install "J-hooks" every 40 to 80 feet. These are curved sections of silt fence above the continuous fence that serve as small dams to stop and hold the flow to allow sediment to settle.

2.8 FIBER ROLLS

A. On long slopes less than 10:1, and where indicated on the Contract Drawings or recommended by the regulatory agency, Fiber Rolls shall be installed.

B. Fiber Rolls shall be made of wood shavings, coconut fiber or other similar material encased in heavy duty netting.

C. Wooden stakes at 4'-0" on center shall be used to anchor the Fiber Rolls along the contours of the slope.

2.9 AGGREGATE SILT CHECKS

A. Where needed to slow flow velocity, to cause ponding or to protect storm water inlet structures, Aggregate Silt Checks shall be installed.

B. Aggregate Silt Checks shall consist of rock of various sizes ranging from 2 inches to 6 inches contained in or placed on geotextile filter fabric. Pea-stone or gravel-filled bags are acceptable for temporary silt checks in low-flow conditions.

2.10 RIP RAP

A. Rip Rap shall be installed at the outlets of storm drains and on channel banks as noted on the Contract Drawings and/or recommended by state and local regulatory agencies.

B. Rip Rap shall have no less than 80%, by volume, of individual stones that range in size from 0.0247 to 1.483 cubic feet.

2.11 CONSTRUCTION ENTRANCE PAD

A. Contractor shall construct entrance pads at all locations where vehicles will enter or exit the site.

B. Pad shall be a minimum of 20 feet wide, 50 feet long, and 6 inches thick, and consist of No. 2 stone laid on top of filter fabric.

PART 3 - EXECUTION

3.1 GENERAL

A. Erosion and sediment control practices shall be consistent with the requirements of the state and local regulatory agencies and in any case shall be adequate to prevent erosion of disturbed and/or regraded areas.

B. Contractor is responsible for notifying the state regulatory agency concerning inclusion under the NPDES General Permit for Storm Water Discharges from Construction Activities.

C. Gravity sewer lines and force mains that cross steams shall be constructed by methods that maintain normal stream flow and allow for a dry exaction. Water pumped from the excavation shall be contained and allowed to settle prior to reentering the stream. Excavation equipment and vehicles shall operate outside of the flowing portion of the stream. Spoiled material from the sewer line excavation shall not be allowed to enter the flowing portion of the stream. The provisions of this condition shall apply to all types of utility line stream crossings.

D. Removal of riparian vegetation in the utility line right-of-way shall be limited to that necessary for equipment access. Effective erosion and sedimentation control measures must be employed at all times during the project to prevent degradation of waters of the Commonwealth. Site regrading and reseeding will be accomplished within 14 days after disturbance.

3.2 SEEDING

A. The areas to be seeded shall be thoroughly tilled to a depth of at least 4 inches by discing, harrowing, or other approved methods until the condition of the soil is acceptable to the Engineer. After harrowing or discing, the seed bed shall be dragged and/or hand raked to finish grade.

B. The incorporation of the fertilizer and the agricultural lime may be a part of the tillage operation and shall be applied no less than 24 hours nor more than 48 hours before the seed is to be sown.

C. Seed shall be broadcast either by hand or approved sowing equipment at the rate of ninety (90) pounds per acre (two pounds per 1,000 square feet), uniformly distributed over the area. Broadcasting seeding during high winds will not be permitted. The seed shall be drilled or raked into a depth of approximately 2 inches and the seeded areas shall be lightly raked to cover the seed and rolled. Drilling seeding shall be done with approved equipment with drills not more than 3 inches apart. All ridges shall be smoothed out, and all furrows and wheel tracks likely to develop into washes, shall be removed.

D. After the seed has been sown, the areas so seeded shall be mulched with clean straw at the rate of one (1) bale per 1,000 feet (approximately 2-inch loose depth). Mulch on slopes and in all ditches and drainage channels shall be held in place with erosion control blankets.

E. Areas seeded shall be watered and protected until a uniform stand develops, and then inspected periodically and maintained appropriately. Displaced mulch shall be replaced or any damage to the seeded area shall be repaired promptly, both in a manner to cause minimum disturbance to the existing stand of grass. If necessary to obtain a uniform stand, the Contractor shall

refertilize, reseed and remulch as needed. Scattered bare spots up to one (1) square yard in size will be allowed up to a maximum of 10 percent of any area.

F. Payment for seeding and mulching shall be included in the Contractor's bid.

3.3 SOD

A. To install, bring soil to final grade and clear of trash, wood, rock, and other debris. Apply topsoil, fertilizer at approximately 1000 lbs per acre.

B. Use sod within 36 hours of cutting. Lay sod in straight lines. Butt joints tightly, but do not overlap joints or stretch sod. Stagger joints in adjacent rows in a brickwork-type pattern. Use torn or uneven pieces on the end of the row.

C. Notch into existing grass. Anchor sod with pins or stakes if placed on slopes greater than 3:1. Roll or tamp sod after installation and water immediately. Soak to a depth of 4 to 6 inches. Replace sod that grows poorly. Do not cut or lay sod in extremely wet or cold weather. Do not mow regularly until sod is well established.

3.4 INSTALLATION OF EROSION AND SEDIMENT CONTROL DEVICES

A. All erosion and sediment control products and materials shall be installed per manufacturer's recommendations and in accordance with the Kentucky Erosion Prevention and Sediment Control Field Guide.

B. Contractor shall pay special attention to the trenching-in of the bottoms of silt fence, the staking of sediment barriers, and the stapling of erosion control blankets.

3.5 MAINTENANCE OF EROSION AND SEDIMENT CONTROL DEVICES

A. Erosion and sedimentation controls shall be inspected weekly and after rain events of 0.5 inches or greater. Replace silt fencing as needed, filter stone, which is dislodged, erosion control blanket, which is damaged, and make other necessary repairs.

B. Remove sediment from fences and barriers when it accumulates to half the height of the barrier, or more often as needed.

3.6 CLEAN UP

A. Upon completion of the project and/or establishment of satisfactory turf, vegetation or permanent erosion control structures, Contractor shall remove all temporary devices and properly dispose of such.

END OF SECTION 312500

SECTION 315000 – EXCAVATION SUPPORT AND PROTECTION

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. This Section includes, but is not limited to, the following:

1. Shoring and bracing necessary to protect existing buildings, streets, walkways, utilities, and other improvements and excavation against loss of ground or caving embankments.
2. Maintenance of shoring and bracing.
3. Removal of shoring and bracing, as required.

B. Types of shoring and bracing systems include, but are not limited to, the following:

1. Steel H-section (soldier) piles.
2. Timber lagging.
3. Steel sheet piles.
4. Portable Steel Trench Box.

C. Building excavation is specified in another Section.

1.2 RELATED DOCUMENTS

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

1.3 SUBMITTALS

A. General: Submit the following in accordance with Conditions of Contract and Division 01 Specification Section 013323.

B. Layout drawings for excavation support system and other data prepared by, or under the supervision of, a qualified professional engineer. System design and calculations must be acceptable to local authorities having jurisdiction.

1.4 QUALITY ASSURANCE

A. Engineer Qualifications: A professional engineer legally authorized to practice in jurisdiction where Project is located and experienced in providing successful engineering services for excavation support systems similar in extent required for this Project.

B. Supervision: Engage and assign supervision of excavation support system to a qualified professional engineer foundation consultant.

C. Regulations: Comply with codes and ordinances of governing authorities having jurisdiction.

1.5 JOB CONDITIONS

A. Before starting work, verify governing dimensions and elevations. Verify condition of adjoining properties. Take photographs to record any existing settlement or cracking of structures, pavements, and other improvements. Prepare a list of such damages, verified by dated photographs, and signed by Contractor and others conducting investigation.

B. Survey adjacent structures and improvements, employing qualified professional engineer, establishing exact elevations at fixed points to act as benchmarks. Clearly identify benchmarks and record existing elevations.

C. During excavation, resurvey benchmarks weekly, maintaining accurate log of surveyed elevations for comparison with original elevations. Promptly notify the Engineer if changes in elevations occur or if cracks, sags, or other damage is evident.

1.6 EXISTING UTILITIES

A. Protect existing active sewer, water, gas, electricity and other utility services and structures.

B. Notify municipal agencies and service utility companies having jurisdiction. Comply with requirements of governing authorities and agencies for protection, relocation, removal, and discontinuing of services.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide adequate shoring and bracing materials which will support loads imposed. Materials need not be new but should be in serviceable condition.

B. Structural Steel: ASTM A 36.

C. Steel Sheet Piles: ASTM A 328.

D. Timber Lagging: Any species, rough-cut, mixed hardwood, nominal 3 inches thick, unless otherwise indicated.

E. Portable Steel Trench Box shall be OSHA approved.

PART 3 - EXECUTION

3.1 SHORING

A. Wherever shoring is required, locate the system to clear permanent construction and to permit forming and finishing of concrete surfaces. Provide shoring system adequately anchored and braced to resist earth and hydrostatic pressures.

B. Shoring systems retaining earth on which the support or stability of existing structures is dependent must be left in place at completion of work.

3.2 BRACING

A. Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move a brace, install new bracing prior to removal of original brace.

B. Do not place bracing where it will be cast into or included in permanent concrete work, except as otherwise acceptable to Engineer.

C. Install internal bracing, if required, to prevent spreading or distortion of braced frames.

D. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

E. Remove sheeting, shoring, and bracing in stages to avoid disturbance to underlying soils and damage to structures, pavements, facilities, and utilities.

F. Repair or replace, as acceptable to Engineer, adjacent work damaged or displaced through installation or removal of shoring and bracing work.

END OF SECTION 315000

DIVISION 33

UTILITIES

SECTION 330523 – STEEL CASING PIPE

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment, and services required to furnish and install all bored and jacked carrier pipes in encasement pipes under railroad and highway crossings as shown on the Drawings and/or specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork: Section 312000

B. Piping: Division 33

1.3 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.

B. At the time of submission, the Contractor shall, in writing, call the Engineer's attention to any deviations that the submittals may have from the requirements of the Contract Drawings and Specifications.

C. Comply with all requirements of Section 013323.

D. In accordance with the requirements of the General and Special Conditions and this Section, the following table includes, but is not limited to, the items required to be submitted:

Item Description	Shop Drawings	Product Data	Schedules	Installation Data	Parts Lists	Wiring Diagram	Samples	O & M Manual	Certificates	Warranty	Report	Other
Carrier Pipe		X							X			
Casing Pipe		X										
Casing Spacers		X		X								
Casing End Seals		X		X								

1.4 EXISTING CONDITIONS

A. The existing piping & other utilities shown on the Contract Drawings is based on the best available information. The Engineer makes no guarantee as to the accuracy of the locations or type of piping or utility depicted. All new piping which ties into existing lines must be made compatible with that piping.

B. So that piping conflicts may be avoided, Contractor shall locate the utility (vertically & horizontally) well ahead of the pipe laying operation to confirm exact locations of existing piping before installing any new piping.

C. Contractor shall provide all fittings and adapters necessary to complete all connections to existing piping.

PART 2 - PRODUCTS

2.1 CARRIER PIPE

A. Carrier pipe shall be as specified in the applicable Division 33 section unless otherwise noted.

B. The pipe push-on joints shall be restrained by use of a rubber gasket that has stainless steel wedging segments spaced around the gasket. Restrained push-on joint rubber gasket shall be Fast-Grip by American Ductile Iron Pipe, Field Lok 350 Gasket by US Pipe, or Engineer-approved equal.

2.2 CASING PIPE

A. Casing pipe shall be steel, plain end, have a minimum yield point strength of 35,000 psi, and conform to ASTM A 252 Grade 2 or ASTM A 139 Grade B without hydrostatic tests. The steel pipe shall have welded joints and be at least 18 feet in length.

B. The diameter of the casing pipe shall be as follows:

Carrier Pipe Nominal Diameter (Inches)															
4	6	8	10	12	14	15	16	18	20	21	24	27	30	33	36
Casing Pipe Nominal Diameter (Inches)															
10	12	16	18	20	24	24	30	30	30	36	36	42	48	50	50

For carrier pipe sizes greater than 36 inches nominal diameter, the casing pipe diameter size shall be determined by the Engineer or as shown on the Contract Drawings.

C. The wall thickness of the casing pipe shall be as follows:

Casing Pipe Nominal Diameter (Inches)								
Under 20	20 & 22	24	30	36	38	42	48	50
Casing Pipe Nominal Thickness (Inches) - Under Paved Roads Under CSX or other Railroad Right of Way if Coated or Cathodically Protected								
.250 (1/4")	.281 (9/32")	.312 (5/16")	.406 (13/32")	.469 (15/32")	.500 (1/2")	.562 (9/16")	.625 (10/16")	.656 (21/32")
Casing Pipe Nominal Thickness (Inches) - Under CSX or other Railroad Right of Way Uncoated and Cathodically Unprotected								
.312 (5/16")	.344 (11/32")	.375 (3/8")	.469 (15/32")	.532 (17/32")	.562 (9/16")	.625 (5/8")	.688 (11/16")	.719 (23/32")

However, should casing pipe thickness be specified or required on Highway or Railroad permit approval sheets, said permit thickness requirement shall govern. Permit approval sheets will be made available to the Contractor.

2.3 CASING SPACERS

A. Casing spacers shall be installed a maximum of eight (8) feet apart along the length of the carrier pipe and within two (2) feet of each side of a pipe joint, to support the pipe barrel and the weight of its contents. Stainless steel casing spacers shall be bolt-on style with a shell made in two (2) sections of heavy T-304 stainless steel. Connecting flanges shall be ribbed for extra strength. The shell shall be lined with a PVC liner .090" thick with 85-90 durometer. All nuts and bolts are to be 18-8 stainless steel. Runners shall be made of ultra-high molecular weight polymer with inherent high abrasion resistance and a low coefficient of friction. Runners shall be supported by risers made of heavy T-304 stainless steel. The supports shall be mig welded to the shell and all welds shall be fully passivated. Stainless steel casing spacers shall be made by Cascade Waterworks Mfg. Co., or equal.

2.4 CASING END SEALS

A. The annual space between the steel casing pipe and the carrier pipe shall be sealed by use of interlocking link pipe seals. Seals shall be modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the pipe and wall sleeve. Links shall be loosely assembled with bolts to form a continuous rubber belt around the pipe with pressure plate under each bolt head and nut. After the seal assembly is positioned in the sleeve, tightening of the bolts shall cause the rubber sealing elements to expand and provide an absolutely water-tight seal between the pipe and wall sleeve. Bolts and hardware shall be constructed of 316 stainless steel. Seals shall be "Link-Seal Model S-316 Modular Seal" as manufactured by PSI-Thunderline/Link-Seal, Houston, TX, or approved equal.

B. The Contractor shall determine the required diameter of each casing/carrier pipe installation according to the manufacturer's recommendations before ordering and installing the seal, Carrier pipe shall be accurately centered in the casing pipe and link seals shall be sized,

installed and tightened in accordance with the manufacturer's instructions or per method approved by the Engineer.

PART 3 - EXECUTION

3.1 CROSSINGS - GENERAL

A. Where designated on the drawings, crossings beneath state-maintained roads, not to be disturbed shall be accomplished by boring and jacking a casing pipe.

B. Steel casing pipe for crossings shall be bored and/or jacked (or open cut installed where indicated on the Drawings) into place to the elevations shown on the drawings. All joints between lengths shall be solidly butt-welded with a smooth non-obstructing joint inside. The casing pipe shall be installed without bends. The carrier pipe shall be installed after the casing pipe is in place and shall extend a minimum of two (2) feet beyond each end of the casing to facilitate making joint connections. The carrier shall be braced and centered with casing spacers within the casing pipe to preclude possible flotation. Casing spacers shall be installed a maximum of eight (8) feet apart along the length of the carrier pipe within the casing pipe, within two (2) feet of each side of a pipe joint, and the rest evenly spaced. The height of the supports and runners combined shall be sufficient to keep the carrier pipe at least 0.75 inches from the casing pipe wall at all times. A manufacturer's recommendations may govern these requirements.

C. At each end of the casing pipe, the carrier pipe shall be sealed with casing end seals. The end seals shall extend a minimum of 12 inches in each direction from the end of the casing pipe.

D. Wood skids are not an acceptable method of supporting the carrier pipe.

3.2 CROSSING - RAILROAD

A. All water or sewer line crossings of railroads shall be prominently marked at railroad right-of-way lines, on both sides of the track crossing, by durable, weatherproof signs located over the center of the water line. When possible, signs shall be located so that when standing at one sign, the other marker is visible. Signs shall show the following:

1. Name and address of Owner.
2. Contents of pipe.
3. Pressure in pipe.
4. Pipe depth below grade at point of sign.
5. Emergency telephone number in event of pipe rupture.

B. Contractor must adhere to all safety requirements of the Railway line involved in the crossing.

1. All operations shall be conducted so as to not interfere with, interrupt, or endanger the operation of trains nor damage, destroy, or endanger the integrity of railroad facilities. The Contractor shall provide written acknowledgment to the Railway line that the Contractor and its employees have received, read, and understood the safety rules. Operations will be subject to inspection at any and all time.

2. All cranes, lifts, or other equipment that will be operated in the vicinity of the railroad's electrification and power transmission facilities shall be electrically grounded in an approved manner.
3. At all times, while work is in progress, a field supervisor with no less than twelve (12) months' experience in the operation of the equipment being used shall be present. If boring equipment or similar machines are being used, the machine operator shall also have a minimum of twelve (12) months' experience in the operation of the equipment being used.
4. Whenever equipment or personnel are working closer than fifteen (15) feet from the centerline of an adjacent track, that track shall be considered as being obstructed. Operations closer than fifteen (15) feet from the centerline of the track shall be conducted only with the permission of, and as directed by, a duly qualified railroad employee present at the site of the work.
5. Crossing the tracks at grade by equipment and personnel is prohibited except by prior arrangement with, and as directed by the railroad line. A separate permit must be obtained, by the Contractor, for any "at grade" crossing of the tracks.

C. All railroad costs incurred by the Railway line due to work associated with the crossing (inspection, flagging, track work, etc.) shall be paid by the Owner. However, it is the Contractor's responsibility to coordinate the work with the Railway.

D. Contractor shall notify the Railway line's area engineer a minimum of 14 working days prior to desired start of construction.

3.3 BORING AND JACKING

A. The Contractor shall excavate his own pits, as he may deem necessary, and will set his own line and grade stakes which shall be checked by the Engineer. Permits, as required, will be furnished or obtained by the Owner, but shall be in the Contractor's hands before any excavating is commenced.

B. The boring method shall consist of pushing the pipe into the earth with a boring auger rotating within the pipe to remove the spoil.

1. The front of the pipe shall be provided with mechanical arrangements or devices that will positively prevent the auger from leading the pipe so that there will be no unsupported excavation ahead of the pipe.
2. The auger and cutting head arrangement shall be removable from within the pipe in the event an obstruction is encountered. If the obstruction cannot be removed without excavation in advance of the pipe, the pipe shall be abandoned in place and immediately filled with grout.
3. The over-cut by the cutting head shall not exceed the outside diameter of the pipe by more than 2 inches. If voids should develop or if the bored hole diameter is greater than the outside diameter of the pipe by more than approximately 1 inch, grouting or other approved methods must be used to fill such voids.
4. The face of the cutting head shall be arranged to provide a reasonable obstruction to the free flow of soft or poor material.
5. Any method which does not have this boring arrangement will not be permitted. The contractor's boring arrangement plans and methods must be submitted to, and approved by, the Engineer.

C. In the event an obstruction is encountered in boring which cannot be removed, and it becomes necessary to withdraw the casing and commence elsewhere, the hole from which the casing is withdrawn shall be completely backfilled with coarse sand rammed in.

D. Insurance to be furnished by the Contractor to cover this type of work shall be adequate to meet the requirements of the Railroad and/or State or County Highway Departments. Insurance shall consist of comprehensive general liability and automobile liability insurance.

E. Before award of the contract, the Contractor shall furnish a statement of his experience of such work, or if inexperienced, shall advise the Owner as to whom he will sublet the work and give a statement of the experience of the subcontractor, which shall be satisfactory to the Owner.

3.4 CONTRACTOR'S RESPONSIBILITIES

A. Obtain a copy of the Highway Encroachment and/or Railroad Permit before beginning construction.

B. Attend a preconstruction meeting at the construction site with the City Inspector, Railroad Inspector, Highway Inspector Engineer, and Contractor being present.

END OF SECTION 330523

PS - FORM 1001-G
REVISED APRIL 29, 2008
AGREEMENT NO. CSX1022331

FACILITY ENCROACHMENT AGREEMENT

THIS AGREEMENT, made and effective as of July 12, 2024, by and between CSX TRANSPORTATION, INC., a Virginia corporation, whose mailing address is 500 Water Street, Jacksonville, Florida 32202, hereinafter called "Licensor," and OLDHAM COUNTY WATER DISTRICT, a municipal corporation, political subdivision or state agency, under the laws of the Commonwealth of Kentucky, whose mailing address is 2160 Spencer Ct., La Grange, Kentucky 40031, hereinafter called "Licensee," WITNESSETH:

WHEREAS, Licensee desires to construct (unless previously constructed and designated as existing herein), use and maintain the below described facility(ies), hereinafter called "Facilities," over, under or across property owned or controlled by Licensor, at the below described location(s):

1. One (1) sixteen inch (16") diameter sub-grade pipeline crossing, solely for the conveyance of potable water, located at or near La Grange, Oldham County, Kentucky, Louisville Division, Louisville Cincinnati Subdivision, Milepost 00T-25.53, Latitude N38:23:58., Longitude W85:24:07.;

hereinafter, called the "Encroachment," as shown on print(s) labeled Exhibit "A," attached hereto and made a part hereof;

NOW, THEREFORE, in consideration of the mutual covenants, conditions, terms and agreements herein contained, the parties hereto agree and covenant as follows:

1. LICENSE:

1.1 Subject to Article 17, Licensor, insofar as it has the legal right, power and authority to do so, and its present title permits, and subject to:

(A) Licensor's present and future right to occupy, possess and use its property within the area of the Encroachment for any and all purposes, including but not limited to Licensor's track(s) structure(s), power lines, communication, signal or other wires, train control system, cellular or data towers, or electrical or electronic apparatus, or any appurtenances thereto ("Licensor's Facilities") and any other facilities as now exist or which may in the future be located in,upon, over, under or across the property;

(B) All encumbrances, conditions, covenants, easements, and limitations applicable to Licensor's title to or rights in the subject property; and

(C) Compliance by Licensee and its agent or contractor ("Licensee's Contractor") with the terms and conditions herein contained;

does hereby license and permit Licensee to construct, maintain, repair, renew, operate, use, alter or change the Facilities at the Encroachment above for the term herein stated, and to remove same upon termination.

1.2 The term Facilities, as used herein, shall include only those structures and ancillary facilities devoted exclusively to the transmission usage above within the Encroachment, and as shown on attached Exhibit A.

1.3 No additional structures or other facilities shall be placed, allowed, or maintained by Licensee in, upon or on the Encroachment except upon prior separate written consent of Licensor.

2. ENCROACHMENT FEE; TERM:

2.1 Licensee shall pay Licensor a one-time nonrefundable Encroachment Fee of FIVE HUNDRED AND 00/100 U.S. DOLLARS ($500.00) upon execution of this Agreement. Licensee agrees that the Encroachment Fee applies only to the original Licensee under this Agreement. In the event of a successor (by merger, consolidation, reorganization and/or assignment) or if the original Licensee changes its name, then Licensee shall be subject to payment of Licensor's current administrative and document preparation fees for the cost incurred by Licensor in preparing and maintaining this Agreement on a current basis.

2.2 However, Licensee assumes sole responsibility for, and shall pay directly (or reimburse Licensor), any additional annual taxes and/or periodic assessments levied against Licensor or Licensor's property solely on account of said Facilities or Encroachment.

2.3 This Agreement shall terminate as herein provided, but shall also terminate upon: (a) Licensee's cessation of use of the Facilities or Encroachment for the purpose(s) above; (b) removal of the Facilities; (c) subsequent mutual consent; and/or (d) failure of Licensee to complete installation within five (5) years from the effective date of this Agreement.

2.4 In further consideration for the license or right hereby granted, Licensee hereby agrees that Licensor shall not be charged or assessed, directly or indirectly, with any part of the cost of the installation of said Facilities and appurtenances, and/or maintenance thereof, or for any public works project of which said Facilities is a part. Licensee agrees it shall not assess Licensor any stormwater or drainage fee associated with such Facilities. Furthermore, Licensee shall be responsible for any stormwater or drainage fees assessed by any County or State agency managing such systems.

3. CONSTRUCTION, MAINTENANCE AND REPAIRS:

3.1 Licensee shall construct, maintain, relocate, repair, renew, alter, and/or remove the Facilities, in a prudent, workmanlike manner, using quality materials and complying with any applicable standard(s) or regulation(s) of Licensor (CSXT Specifications), or Licensee's particular industry, National Electrical Safety Code, or any governmental or regulatory body having jurisdiction over the Encroachment.

3.2 Location and construction of Facilities shall be made strictly in accordance with design(s) and specifications furnished to and approved by Licensor and of material(s) and size(s) appropriate for the purpose(s) above recited.

3.3 All of Licensee's work, and exercise of rights hereunder, shall be undertaken at time(s) satisfactory to Licensor, and so as to eliminate or minimize any impact on or interference with the safe use and operation of Licensor's property and appurtenances thereto.

3.4 In the installation, maintenance, repair and/or removal of said Facilities, Licensee shall not use explosives on or adjacent to Licensor's property of any type or perform or cause any blasting on or adjacent to Licensor's property without the separate express written consent of Licensor. As a condition to such consent, a representative will be assigned by Licensor to monitor blasting, and Licensee shall reimburse Licensor for the entire cost and/or expense of furnishing said monitor.

3.5 Any repairs or maintenance to the Facilities, whether resulting from acts of Licensee, or natural or weather events, which are necessary to protect or facilitate Licensor's use of its property, shall be made by Licensee promptly, but in no event later than thirty (30) days after Licensee has notice as to the need for such repairs or maintenance.

3.6 Licensor, in order to protect or safeguard its property, rail operations, equipment and/or employees from damage or injury, may request immediate repair or renewal of the Facilities, and if the same is not performed, may make or contract to make such repairs or renewals, at the sole risk, cost and expense of Licensee.

3.7 Neither the failure of Licensor to object to any work done, material used, or method of construction or maintenance of said Encroachment, nor any approval given or supervision exercised by Licensor, shall be construed as an admission of liability or responsibility by Licensor, or as a waiver by Licensor of any of the obligations, liability and/or responsibility of Licensee under this Agreement.

3.8 All work on the Encroachment shall be conducted in accordance with Licensor's safety rules and regulations.

3.9 Licensee hereby agrees to reimburse Licensor any loss, cost or expense (including losses resulting from train delays and/or inability to meet train schedules) arising from any failure of Licensee to make repairs or conduct maintenance as required by Section 3.5 above or from improper or incomplete repairs or maintenance to the Facilities or Encroachment.

3.10 In the event it becomes necessary for the Licensee to deviate from the approved Exhibit, Licensee shall seek prior approval from Licensor, or when applicable, an official field representative of Licensor permitted to approve changes, authorizing the necessary field changes and Licensee shall provide Licensor with complete As-Built Drawings of the completed work. As-Built Drawings shall be submitted to Licensor in either electronic or hard copy form upon the substantial completion of the project and upon Licensor's request.

3.11 In the event of large scale maintenance/construction work to railroad bridges Licensee is required to protect power lines with insulated covers or comparable safety devices at their costs during construction/maintenance for safety of railroad employees.

4. PERMITS, LICENSES:

4.1 Before any work hereunder is performed, or before use of the Encroachment for the contracted purpose, Licensee, at its sole cost and expense, shall obtain all necessary permit(s) (including but not limited to zoning, building, construction, health, safety or environmental matters), letter(s) or certificate(s) of approval. Licensee expressly agrees and warrants that it shall conform and limit its activities to the terms of such permit(s), approval(s) and authorization(s), and shall comply with all applicable ordinances, rules, regulations, requirements and laws of any governmental authority (State, Federal or Local) having jurisdiction over Licensee's activities, including the location, contact, excavation and protection regulations of the Occupational Safety and Health Act (OSHA) (29 CFR 1926.651(b)), et al., and State "One Call" - "Call Before You Dig" requirements.

4.2 Licensee assumes sole responsibility for failure to obtain such permit(s) or approval(s), for any violations thereof, or for costs or expenses of compliance or remedy.

5. MARKING AND SUPPORT:

5.1 With respect to any subsurface installation or maintenance upon Licensor's property, Licensee, at its sole cost and expense, shall:

(A) support track(s) and roadbed in a manner satisfactory to Licensor;

(B) backfill with satisfactory material and thoroughly tamp all trenches to prevent settling of surface of land and roadbed of Licensor; and

(C) either remove any surplus earth or material from Licensor's property or cause said surplus earth or material to be placed and distributed at location(s) and in such manner Licensor may approve.

5.2 After construction or maintenance of the Facilities, Licensee shall:

(A) Restore any track(s), roadbed and other disturbed property; and

(B) Erect, maintain and periodically verify the accuracy of aboveground markers, in a form approved by Licensor, indicating the location, depth and ownership of any underground Facilities or related facilities.

5.3 Licensee shall be solely responsible for any subsidence or failure of lateral or subjacent support in the Encroachment area for a period of three (3) years after completion of installation.

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6. TRACK CHANGES:

6.1 In the event that rail operations and/or track maintenance result in changes in grade or alignment of, additions to, or relocation of track(s) or other facilities, or in the event future use of Licensor's rail corridor or property necessitate any change of location, height or depth in the Facilities or Encroachment, Licensee, at its sole cost and expense and within thirty (30) days after notice in writing from Licensor, shall make changes in the Facilities or Encroachment to accommodate such track(s) or operations.

6.2 If Licensee fails to do so, Licensor may make or contract to make such changes at Licensee's cost.

7. FACILITY CHANGES:

7.1 Licensee shall periodically monitor and verify the depth or height of the Facilities or Encroachment in relation to the existing tracks and facilities, and shall relocate the Facilities or change the Encroachment, at Licensee's expense, should such relocation or change be necessary to comply with the minimum clearance requirements of Licensor.

7.2 If Licensee undertakes to revise, renew, relocate or change in any manner whatsoever all or any part of the Facilities (including any change in voltage or gauge of wire or any change in circumference, diameter or radius of pipe or change in materials transmitted in and through said pipe), or is required by any public agency or court order to do so, plans therefor shall be submitted to Licensor for approval before such change. After approval, the terms and conditions of this Agreement shall apply thereto.

8. INTERFERENCE WITH RAIL FACILITIES:

8.1 Although the Facilities/Encroachment herein permitted may not presently interfere with Licensor's Facilities, in the event that the operation, existence or maintenance of said Facilities, in the sole judgment of Licensor, causes: (a) interference (including, but not limited to, physical or interference from an electromagnetic induction, or interference from stray or other currents) with Licensor's power lines, communication, signal or other wires, train control system, or electrical or electronic apparatus; or (b) interference in any manner, with the operation, maintenance or use of Licensor's Facilities; then and in either event, Licensee, upon receipt of written notice from Licensor of any such interference, and at Licensee's sole risk, cost and expense, shall promptly make such changes in its Facilities or installation, as may be required in the reasonable judgment of the Licensor to eliminate all such interference. Upon Licensee's failure to remedy or change, Licensor may do so or contract to do so at Licensee's sole cost.

8.2 Without assuming any duty hereunder to inspect the Facilities, Licensor hereby reserves the right to inspect same and to require Licensee to undertake repairs, maintenance or adjustments to the Facilities, which Licensee hereby agrees to make promptly, at Licensee's sole cost and expense.

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9. RISK, LIABILITY, INDEMNITY:

With respect to the relative risk and liabilities of the parties, it is hereby agreed that:

9.1 To the fullest extent permitted by State law (constitutional or statutory, as amended), Licensee hereby agrees to, defend, indemnify, and hold Licensor harmless from and against any and all liability, loss, claim, suit, damage, charge or expense which Licensor may suffer, sustain, incur or in any way be subjected to, on account of death of or injury to any person whomsoever (including officers, agents, employees or invitees of Licensor), and for damage to or loss of or destruction of any property whatsoever, arising out of, resulting from, or in any way connected with the construction, repair, maintenance, replacement, presence, existence, operations, use or removal of the Facilities or any structure in connection therewith, or restoration of premises of Licensor to good order or condition after removal, EXCEPT when proven to have been caused solely by the willful misconduct or gross negligence of Licensor. HOWEVER, to the fullest extent permitted by State law, during any period of actual construction, repair, maintenance, replacement or removal of the Facilities, wherein agents, equipment or personnel of Licensee are on the railroad rail corridor, Licensee's liability hereunder shall be absolute, irrespective of any joint, sole or contributory fault or negligence of Licensor.

9.2 Licensee's Contractor shall hereby agree to, defend, indemnify, and hold Licensor harmless from and against any and all liability, loss, claim, suit, damage, charge or expense which Licensor may suffer, sustain, incur or in any way be subjected to, on account of death of or injury to any person whomsoever (including officers, agents, employees or invitees of Licensor), and for damage to or loss of or destruction of any property whosoever, arising out of resulting from, or in any way connected with the construction, repair, maintenance, replacement, presence, existence, operations, use or removal of the Facilities or any structure in connection therewith, or restoration of premises of Licensor to good order or condition after removal, EXCEPT when proven to have been caused solely by the willful misconduct or gross negligence of Licensor. HOWEVER, to the fullest extent permitted by State law, during any period of actual construction, repair, maintenance, replacement or removal of the Facilities, wherein agents, equipment or personnel of Licensee are on the railroad rail corridor, Licensee's liability hereunder shall be absolute, irrespective of any joint, sole or contributory fault or negligence of Licensor.

9.3 Use of Licensor's rail corridor involves certain risks of loss or damage as a result of the rail operations. Notwithstanding Section 9.1, Licensee expressly assumes all risk of loss and damage to Licensee's Property or the Facilities in, on, over or under the Encroachment, including loss of or any interference with use or service thereof, regardless of cause, including electrical field creation, fire or derailment resulting from rail operations. For this Section, the term "Licensee's Property" shall include property of third parties situated or placed upon Licensor's rail corridor by Licensee or by such third parties at request of or for benefit of Licensee.

9.4 To the fullest extent permitted by State law, as above, Licensee assumes all responsibility for, and agrees to defend, indemnify and hold Licensor harmless from: (a) all

claims, costs and expenses, including reasonable attorneys' fees, as a consequence of any sudden or nonsudden pollution of air, water, land and/or ground water on or off the Encroachment area, arising from or in connection with the use of this Encroachment or resulting from leaking, bursting, spilling, or any escape of the material transmitted in or through the Facilities; (b) any claim or liability arising under federal or state law dealing with either such sudden or nonsudden pollution of air, water, land and/or ground water arising therefrom or the remedy thereof; (c) any subsidence or failure of lateral or subjacent support of the tracks arising from such Facilities leakage; and (d) all claims, costs and expenses, including reasonable attorneys' fees, as a consequence of any drainage or runoff on or off the Encroachment area as a result of the Facilities/Encroachment herein permitted.

9.5 Notwithstanding Section 9.1, Licensee also expressly assumes all risk of loss which in any way may result from Licensee's failure to maintain either required clearances for any overhead Facilities or the required depth and encasement for any underground Facilities, whether or not such loss(es) result(s) in whole or part from Licensor's contributory negligence or joint fault.

9.6 Obligations of Licensee hereunder to release, indemnify and hold Licensor harmless shall also extend to companies and other legal entities that control, are controlled by, subsidiaries of, or are affiliated with Licensor, as well as any railroad that operates over the rail corridor on which the Encroachment is located, and the officers, employees and agents of each.

9.7 If a claim is made or action is brought against Licensor, and/or its operating lessee, for which Licensee may be responsible hereunder, in whole or in part, Licensee shall be notified to assume the handling or defense of such claim or action; but Licensor may participate in such handling or defense.

9.8 Notwithstanding anything contained in this Agreement, the limitation of liability contained in the state statutes, as amended from time to time, shall not limit Licensor's ability to collect under the insurance policies required to be maintained under this Agreement.

10. INSURANCE:

10.1 Prior to commencement of surveys, installation or occupation of premises pursuant to this Agreement, Licensee shall procure and shall maintain during the continuance of this Agreement, at its sole cost and expense, a policy of

(i) Statutory Worker's Compensation and Employers Liability Insurance with available limits of not less than ONE MILLION AND 00/100 U.S. DOLLARS ($1,000,000.00).

(ii) Commercial General Liability coverage (inclusive of contractual liability) with available limits of not less than FIVE MILLION AND 00/100 U.S. DOLLARS ($5,000,000.00)in combined single limits for bodily injury and property damage and covering the contractual liabilities assumed under this Agreement and naming Licensor, and/or its designee, as additional insured. The evidence of insurance

coverage shall be endorsed to provide for thirty (30) days' notice to Licensor, or its designee, prior to cancellation or modification of any policy. Mail CGL certificate, along with agreement, to CSX Transportation, Inc., Speed Code J180, 500 Water Street, Jacksonville, FL 32202. On each successive year, send certificate to RenewalCOI@csx.com.

(iii) Business automobile liability insurance with available limits of not less than ONE MILLION AND 00/100 U.S. DOLLARS ($1,000,000.00) combined single limit for bodily injury and/or property damage per occurrence naming Licensor, and/or its designee, as additional insured.

(iv) The insurance policies must contain a waiver of subrogation against CSXT and its Affiliates, except where prohibited by law. All insurance companies must be A. M. Best rated A- and Class VII or better.

(v) Such other insurance as Licensor may reasonably require.

(vi) Licensee shall require its contractors to meet minimum insurance requirements above when performing work in relation to this agreement. Licensee will procure and review contractor's insurance certificates to confirm requirements are met. Licensor may request a copy of the insurance certificate.

10.2 If Licensee's Contractor's existing CGL policy(ies) do(es) not automatically cover Licensee's contractual liability during periods of survey, installation, maintenance and continued occupation, a specific endorsement adding such coverage shall be purchased by Licensee's Contractor. If said CGL policy is written on a "claims made" basis instead of a "per occurrence" basis, Licensee shall arrange for adequate time for reporting losses. Failure to do so shall be at Licensee's sole risk.

10.3 Licensor, or its designee, may at any time request evidence of insurance purchased by Licensee to comply with this Agreement. Failure of Licensee to comply with Licensor's request shall be considered a default by Licensee.

10.4 To the extent permitted by law and notwithstanding anything to the contrary in this Agreement, the insurance required and provided by Licensee shall not be subject to the limitations of sovereign immunity.

10.5 (A) In the event Licensee finds it necessary to perform construction or demolition operations within fifty feet (50') of any operated railroad track(s) or affecting any railroad bridge, trestle, tunnel, track(s), roadbed, overpass or underpass, Licensee shall: (a) notify Licensor; and (b) require Licensee's Contractor(s) performing such operations to procure and maintain during the period of construction or demolition operations, at no cost to Licensor, Railroad Protective Liability (RPL) Insurance, naming Licensor, and/or its designee, as Named Insured, written on the current ISO/RIMA Form (ISO Form No. CG 00 35 04 13) with limits of FIVE MILLION AND 00/100 U.S. DOLLARS ($5,000,000.00) per occurrence for bodily injury and property damage, with at least TEN MILLION AND 00/100 U.S. DOLLARS

($10,000,000.00) aggregate limit per annual policy period. The original of such RPL policy shall be sent to and approved by Licensor prior to commencement of such construction or demolition. Licensor reserves the right to demand higher limits.

(B) At Licensor's option, in lieu of purchasing RPL insurance or the 50 foot endorsements from an insurance company (but not CGL insurance), Licensee may pay Licensor, at Licensor's current rate at time of request, the cost of adding this Encroachment, or additional construction and/or demolition activities, to Licensor's Railroad Protective Liability (RPL) Policy for the period of actual construction. This coverage is offered at Licensor's discretion and may not be available under all circumstances.

10.6 Notwithstanding the provisions of Sections 10.1 and 10.2, Licensee, pursuant to State Statute(s), may self-insure or self-assume, in any amount(s), any contracted liability arising under this Agreement, under a funded program of self-insurance, which fund will respond to liability of Licensee imposed by and in accordance with the procedures established by law.

11. GRADE CROSSINGS; PROTECTION SERVICES:

11.1 Nothing herein contained shall be construed to permit Licensee or Licensee's contractor to move any vehicles or equipment over the track(s), except at public road crossing(s), without separate prior written approval of Licensor.

11.2 If Licensor deems it advisable, during any construction, maintenance, repair, renewal, alteration, change or removal of said Facilities, to place watchmen, flagmen, or field construction managers for protection of operations of Licensor or others on Licensor's rail corridor at the Encroachment, and to keep persons, equipment or materials away from the track(s), Licensor shall have the right to do so at the expense of Licensee, but Licensor shall not be liable for failure to do so.

11.3 Subject to consent of Licensor, in its sole discretion, and subject to Licensor's operating rules and labor agreements, Licensee may provide flagmen, in place of Licensor's provision, at Licensee's sole risk, cost and expense, and in such event, Licensor shall not be liable for the failure or neglect of such flagmen. Such flagmen shall be approved by Licensor and shall meet all Licensor's requirement for performing such work.

12. LICENSOR'S COSTS:

12.1 Any additional or alternative costs or expenses incurred by Licensor to accommodate Licensee's continued use of Licensor's property as a result of track changes or changes to Licensor's Facilities shall also be paid by Licensee.

12.2 Licensor's expense for wages ("force account" charges) and materials for any work performed at the expense of Licensee pursuant hereto shall be paid by Licensee within thirty (30) days after receipt of Licensor's bill therefor. Licensor may, at its discretion, request an advance deposit for estimated Licensor costs and expenses.

12.3 Such expense shall include, but not be limited to, cost of railroad labor and supervision under "force account" rules, plus current applicable overhead percentages, the actual cost of materials, and insurance, freight and handling charges on all material used. Equipment rentals shall be in accordance with Licensor's applicable fixed rate. Licensor may, at its discretion, require advance deposits for estimated costs of such expenses and costs.

13. DEFAULT, BREACH, WAIVER:

13.1 The proper and complete performance of each covenant of this Agreement shall be deemed of the essence thereof, and in the event Licensee fails or refuses to fully and completely perform any of said covenants or remedy any breach within thirty (30) days after receiving written notice from Licensor to do so (or within forty-eight (48) hours in the event of notice of a railroad emergency), Licensor shall have the option of immediately revoking this Agreement and the privileges and powers hereby conferred, regardless of encroachment fee(s) having been paid in advance for any annual or other period. Upon such revocation, Licensee shall make removal in accordance with Article 14.

13.2 No waiver by Licensor of its rights as to any breach of covenant or condition herein contained shall be construed as a permanent waiver of such covenant or condition, or any subsequent breach thereof, unless such covenant or condition is permanently waived in writing by Licensor.

13.3 Neither the failure of Licensor to object to any work done, material used, or method of construction or maintenance of said Encroachment, nor any approval given or supervision exercised by Licensor, shall be construed as an admission of liability or responsibility by Licensor, or as a waiver by Licensor of any of the obligations, liability and/or responsibility of Licensee under this Agreement.

14. TERMINATION, REMOVAL:

14.1 All rights which Licensee may have hereunder shall cease upon the date of (a) termination, (b) revocation, or (c) subsequent agreement, or (d) Licensee's removal of the Facility from the Encroachment. However, neither termination nor revocation of this Agreement shall affect any claims and liabilities which have arisen or accrued hereunder, and which at the time of termination or revocation have not been satisfied; neither party, however, waiving any third party defenses or actions.

14.2 Within thirty (30) days after revocation or termination, Licensee, at its sole risk and expense, shall (a) remove the Facilities from the rail corridor of Licensor, unless the parties hereto agree otherwise, (b) restore the rail corridor of Licensor in a manner satisfactory to Licensor, and (c) reimburse Licensor any loss, cost or expense of Licensor resulting from such removal.

15. NOTICE:

15.1 Licensee shall give Licensor at least thirty (30) days written notice before doing any work on Licensor's rail corridor, except that in cases of emergency shorter notice may be given. Licensee shall provide proper notification as follows:

a. For non-emergencies, Licensee shall submit online via the CSX Property Portal from Licensor's web site, via web link: https://propertyportal.csx.com/pub_ps_res/ps_res/jsf/public/index.faces

b. For emergencies, Licensee shall complete all of the steps outlined in Section 15.1 a. above, and shall also include detailed information of the emergency. Licensee shall also call and report details of the emergency to Licensor's Rail Operations Emergency Telephone Number: 1-800-232-0144. In the event Licensor needs to contact Licensee concerning an emergency involving Licensee's Facility(ies), the emergency phone number for Licensee is: 502-222-1690.

15.2 All other notices and communications concerning this Agreement shall be addressed to Licensee at the address above, and to Licensor at the address shown on Page 1, c/o CSXT Contract Management, J180; or at such other address as either party may designate in writing to the other.

15.3 Unless otherwise expressly stated herein, all such notices shall be in writing and sent via Certified or Registered Mail, Return Receipt Requested, or by courier, and shall be considered delivered upon: (a) actual receipt, or (b) date of refusal of such delivery.

16. ASSIGNMENT:

16.1 The rights herein conferred are the privileges of Licensee only, and Licensee shall obtain Licensor's prior written consent to any assignment of Licensee's interest herein; said consent shall not be unreasonably withheld.

16.2 Subject to Sections 2 and 16.1, this Agreement shall be binding upon and inure to the benefit of the parties hereto and their respective successors or assigns.

16.3 Licensee shall give Licensor written notice of any legal succession (by merger, consolidation, reorganization, etc.) or other change of legal existence or status of Licensee, with a copy of all documents attesting to such change or legal succession, within thirty (30) days thereof.

16.4 Licensor expressly reserves the right to assign this Agreement, in whole or in part, to any grantee, lessee, or vendee of Licensor's underlying property interests in the Encroachment, upon written notice thereof to Licensee.

16.5 In the event of any unauthorized sale, transfer, assignment, sublicense or encumbrance of this Agreement, or any of the rights and privileges hereunder, Licensor, at its option, may revoke this Agreement by giving Licensee or any such assignee written notice of such revocation; and Licensee shall reimburse Licensor for any loss, cost or expense Licensor may incur as a result of Licensee's failure to obtain said consent.

17. TITLE:

17.1 Licensee understands that Licensor occupies, uses and possesses lands, rights-of-way and rail corridors under all forms and qualities of ownership rights or facts, from full fee simple absolute to bare occupation. Accordingly, nothing in this Agreement shall act as or be deemed to act as any warranty, guaranty or representation of the quality of Licensor's title for any particular Encroachment or segment of Rail Corridor occupied, used or enjoyed in any manner by Licensee under any rights created in this Agreement. It is expressly understood that Licensor does not warrant title to any Rail Corridor and Licensee will accept the grants and privileges contained herein, subject to all lawful outstanding existing liens, mortgages and superior rights in and to the Rail Corridor, and all leases, licenses and easements or other interests previously granted to others therein.

17.2 The term "license," as used herein, shall mean with regard to any portion of the Rail Corridor which is owned by Licensor in fee simple absolute, or where the applicable law of the State where the Encroachment is located otherwise permits Licensor to make such grants to Licensee, a "permission to use" the Rail Corridor, with dominion and control over such portion of the Rail Corridor remaining with Licensor, and no interest in or exclusive right to possess being otherwise granted to Licensee. With regard to any other portion of Rail Corridor occupied, used or controlled by Licensor under any other facts or rights, Licensor merely waives its exclusive right to occupy the Rail Corridor and grants no other rights whatsoever under this Agreement, such waiver continuing only so long as Licensor continues its own occupation, use or control. Licensor does not warrant or guarantee that the license granted hereunder provides Licensee with all of the rights necessary to occupy any portion of the Rail Corridor. Licensee further acknowledges that it does not have the right to occupy any portion of the Rail Corridor held by Licensor in less than fee simple absolute without also receiving the consent of the owner(s) of the fee simple absolute estate. Further, Licensee shall not obtain, exercise or claim any interest in the Rail Corridor that would impair Licensor's existing rights therein.

17.3 Licensee agrees it shall not have nor shall it make, and hereby completely and absolutely waives its right to, any claim against Licensor for damages on account of any deficiencies in title to the Rail Corridor in the event of failure or insufficiency of Licensor's title to any portion thereof arising from Licensee's use or occupancy thereof.

17.4 Licensee agrees to fully and completely indemnify and defend all claims or litigation for slander of title, overburden of easement, or similar claims arising out of or based upon the Facilities placement, or the presence of the Facilities in, on or along any Encroachment(s), including claims for punitive or special damages.

17.5 Licensee shall not at any time own or claim any right, title or interest in or to Licensor's property occupied by the Encroachments, nor shall the exercise of this Agreement for any length of time give rise to any right, title or interest in Licensee to said property other than the license herein created.

17.6 Nothing in this Agreement shall be deemed to give, and Licensor hereby expressly waives, any claim of ownership in and to any part of the Facilities.

17.7 Licensee shall not create or permit any mortgage, pledge, security, interest, lien or encumbrances, including without limitation, tax liens and liens or encumbrances with respect to work performed or equipment furnished in connection with the construction, installation, repair, maintenance or operation of the Facilities in or on any portion of the Encroachment (collectively, "Liens or Encumbrances"), to be established or remain against the Encroachment or any portion thereof or any other Licensor property.

17.8 In the event that any property of Licensor becomes subject to such Liens or Encumbrances, Licensee agrees to pay, discharge or remove the same promptly upon Licensee's receipt of notice that such Liens or Encumbrances have been filed or docketed against the Encroachment or any other property of Licensor; however, Licensee reserves the right to challenge, at its sole expense, the validity and/or enforceability of any such Liens or Encumbrances.

18. GENERAL PROVISIONS:

18.1 This Agreement, and the attached specifications, contains the entire understanding between the parties hereto.

18.2 Neither this Agreement, any provision hereof, nor any agreement or provision included herein by reference, shall operate or be construed as being for the benefit of any third person.

18.3 Except as otherwise provided herein, or in any Rider attached hereto, neither the form of this Agreement, nor any language herein, shall be interpreted or construed in favor of or against either party hereto as the sole drafter thereof.

18.4 This Agreement is executed under current interpretation of applicable Federal, State, County, Municipal or other local statute, ordinance or law(s). However, each separate division (paragraph, clause, item, term, condition, covenant or agreement) herein shall have independent and severable status for the determination of legality, so that if any separate division is determined to be void or unenforceable for any reason, such determination shall have no effect upon the validity or enforceability of each other separate division, or any combination thereof.

18.5 This Agreement shall be construed and governed by the laws of the state in which the Facilities and Encroachment are located.

18.6 If any amount due pursuant to the terms of this Agreement is not paid by the due date, it will be subject to Licensor's standard late charge and will also accrue interest at eighteen percent (18%) per annum, unless limited by local law, and then at the highest rate so permitted.

18.7 Licensee agrees to reimburse Licensor for all reasonable costs (including attorney's fees) incurred by Licensor for collecting any amount due under the Agreement.

18.8 The provisions of this License are considered confidential and may not be disclosed to a third party without the consent of the other party(s), except: (a) as required by statute, regulation or court order, (b) to a parent, affiliate or subsidiary company, (c) to an auditing firm or legal counsel that are agreeable to the confidentiality provisions, or (d) to Lessees of Licensor's land and/or track who are affected by the terms and conditions of this Agreement and will maintain the confidentiality of this Agreement.

18.9 Within thirty (30) days of an overpayment in a cumulative total amount of One Hundred Dollars ($100.00) or more by Licensee to Licensor, Licensee shall notify Licensor in writing with documentation evidencing such overpayment. Licensor shall refund the actual amount of Licensee's overpayment within one hundred twenty (120) days of Licensor's verification of such overpayment.

18.10 This Agreement may be executed in any number of counterparts, and such counterparts may be exchanged by electronic transmission. Upon execution by the parties hereto, each counterpart shall be deemed an original and together shall constitute one and the same instrument. A fully executed copy of this Agreement by electronic transmission shall be deemed to have the same legal effect as delivery of an original executed copy of this Agreement for all purposes.

19. CONTRACTOR'S ACCEPTANCE:

19.1 Licensee shall observe and abide by, and shall require Licensee's Contractors to observe and abide by the terms, conditions and provisions set forth in this Agreement. Prior to any commencement of work under this Agreement by Licensee's Contractor, Licensee shall require Licensee's Contractor to execute and deliver to Licensor the Contractor Acceptance form attached hereto as Schedule A to acknowledge Licensee's Contractor's agreement to observe and abide by terms and conditions of the Agreement.

[signature page follows]

PS - FORM 1001-G
REVISED APRIL 29, 2008
AGREEMENT NO. CSX1022331

IN WITNESS WHEREOF, the parties hereto have executed this Agreement in duplicate (each of which shall constitute an original) as of the effective date of this Agreement.

Witness for Licensor:

John White

CSX TRANSPORTATION, INC.

By: EHH

Print/Type Name: Eric Horton

Print/Type Title: Manager - Real Estate

Witness for Licensee:

Shanna Stone

OLDHAM COUNTY WATER DISTRICT

By: Russell D. Rose

Who, by the execution hereof, affirms that he/she has the authority to do so and to bind the Licensee to the terms and conditions of this Agreement.

Print/Type Name: Russell D. Rose

Print/Type Title: Chief Executive Officer

Tax ID No.: 61-0984582

PS - FORM 1001-G
REVISED APRIL 29, 2008
AGREEMENT NO. CSX1022331

Schedule "A"

CONTRACTOR'S ACCEPTANCE

This Amendment is and shall be a part of Agreement No. CSX1022331, and is incorporated therein.

To and for the benefit of CSX TRANSPORTATION, Inc. (Licensor") and to induce Licensor to permit Contractor on or about Licensor's property for the purposed of performing work in accordance with the Agreement dated July 12, 2024, between Licensee and Licensor, Contractor hereby agrees to abide by and perform all applicable terms of the Agreement, including, but not limited to Sections 3, 9, 10 of the Agreement.

Witness for Licensor:

_____

CSX TRANSPORTATION INC.

By:_____

Print/Type Name:_____

Print/Type Title:_____

Witness for Licensee's Contractor

_____

_____
LICENSEE'S CONTRACTOR

By: _____
Who, by the execution hereof, affirms that he/she has the authority to do so and to bind the Licensee has the authority to do so and to bind the Licensee to the terms and conditions of this Agreement

NAME: _____

TITLE: _____

DATE: _____

CSX Transportation (CSXT) General Notes (Bore and Jack):

La Grange, KY
Engineering Region (Division): MIDWEST (MW) / Sub Division: LOUISVILLE CINCINNATI (LC) / Nearest DOT: 345579D
Mile Post: 00T 25.5 / Lat_Long: 38.39952,-85.40211

1) CSXT owns its right-of-way for the primary purpose of operating a railroad, and shall maintain unrestricted use of its property for current and future operations.

2) Agency or its contractor shall arrange and conduct its work so that there will be no interference with CSXT operations, including train, signal, telephone and telegraphic services, or damages to CSXT's property, or to poles, wires, and other facilities of tenants of CSXT's property or right-of-way.

3) Refer to the CSXT's "Design & Construction Standard Specifications Pipeline Occupancies" revised June 5, 2018 (4.1.2).

4) Work schedule is subject to the approval of all required construction submittals by the CSXT Construction Representative, verification that proposed work will not conflict with any CSXT U.G. Facilities, and the availability of CSXT Flagging and Protection Services. Construction submittals will be based upon the proposed scope of work and may include, but are not limited to; proposed work plan, project schedule, means and methods, site access, dewatering, temporary excavation/shoring, soil disposition/management, track monitoring, concrete placement work, structural lifting/rigging plans for hoisting operations, substructure construction plans, steel erection plans, roadwork plans, etc. No work may begin on, over, or adjacent to CSXT property, or that could potentially impact CSXT property, operations or safety without the prior completion and approval of the required aforementioned information and approvals.

5) Prior to construction, all signal facilities and/or warning devices at proposed facility crossing, i.e. cantilevers, flashers, and gates must be located and marked/flagged by CSXT. The traditional "One Call" utility locate services are not responsible for locating any CSXT under-grade utilities or facilities Contractor shall be held liable for any damages to CSXT communication & signal facilities.

6) Contractor also has the sole responsibility of ascertaining that all other utilities have been properly located by complying with the local "call before you dig" regulation(s). Contractor shall solely be responsible for notifying owners of adjacent properties and of underground facilities and utility owners when prosecution of the work may affect them, and shall cooperate with them in the protection, removal, relocation and replacement of their property.

7) The use of construction safety fencing is required when a CSXT Flagman is not present. Distance of fencing from nearest rail to be determined by the CSXT Track Supervisor and shall be removed upon completion of the project.

8) Contractor access will be limited to the immediate project area only. The CSXT property outside the project area may not be used for contractor access to the project site and no temporary at-grade crossings will be allowed.

9) All material and equipment will be staged to not block any CSXT access or maintenance roads. No hoisting or auxiliary equipment necessary for the procedure shall be placed on CSXT track structure and / or ballast section. Clear working locations for equipment used will be laid out and approved by CSXT's representative prior to equipment set-up. Agency and contractor shall not store their materials or equipment on CSXT's property or where they may potentially interfere with CSXT's operations.

10) CSXT does not grant or convey an easement for this installation.

11) CSXT requires contractors, subcontractors, and vendors to participate in job safety briefings daily and as necessary with the CSXT flagger. The scope of work may require that various protection against train movements be discussed, understood, and utilized. Work shall only be undertaken with the presence and permission of the CSXT flagger. If at any time the CSXT flagger perceives that the hoisting procedure is causing or has the potential to cause a hazard or delay to CSXT operations through the project site, work will cease until such time as satisfactory modifications have been reviewed and approved.

12) The right of way shall be restored to a condition equal to or better than the condition prior to beginning the project before final acceptance will be provided. Punch lists shall be responded to prior to issuance of an acceptance memorandum signed by the CSXT representative.

13) No construction or entry upon the CSXT corridor is permitted until the document transaction is completed, you are in receipt of a fully executed document, and you have obtained authority from CSXT's.

14) The front of the pipe shall be provided with mechanical arrangements or devices that will positively prevent the auger from leading the pipe so that no unsupported excavation is ahead of the pipe. The bore head / auger set-up (sketch or photos) shall be submitted by contractor and accepted by assigned CSXT representative prior to start of the jack & bore.

15) The operation shall be progressed on a 24-hour basis without stoppage (except for adding lengths of pipe) until the leading edge of the pipe has reached the receiving pit.

16) The auger and cutting head arrangement shall be removable from within the pipe in the event an obstruction is encountered.

17) Pipeline shall be prominently marked at both sides of the CSXT property lines by durable, weatherproof signs located over the centerline of the pipe in accordance with CSXT specifications.

18) If required, a dewatering plan in accordance with CSXT specifications will be submitted to the CSXT representative for review and approval prior to any dewatering operations. Dewatering drawdown level at tracks shall be field verified that it meets the approved dewatering design prior to commencement of jack and bore operations.

19) Blasting is not permitted under, on, or adjacent to CSXT property.

Revised January 31, 2023

20) Jacking pit: identify hazards and put controls in place prior to start of excavation. Contractor shall erect a barrier and construction fence along the face of jacking pit construction limits and not encroach past it when preparing the pit. Stake or mark pit as needed for digging. Erosion control devices shall be placed at the jacking and receiving pits protecting CSXT property and ditches to the satisfaction of the CSXT representative.

21) Excavation: If the excavation is 5 feet or greater in depth, the walls may be sloped at 1.5 horizontal to 1 vertical to reduce the risk of cave-ins or slides. A safe manner in which to enter and exit the excavation must be established. The toe of slopes in excavation shall in no case be undercut by power shovels, bulldozers, graders, blasting, or in any manner. Excavation shall not be made in excess of the authorized cross-section.

22) Backfill, cover or fence all excavations when unattended. The CSXT representative will approve the protection method and the type of fencing material. Set fencing back at least 3 feet (91 centimeters) from the edges of the excavation. Set fence posts securely in the ground and insure the fencing is securely tied to posts with zip ties or some other tie wrap product.

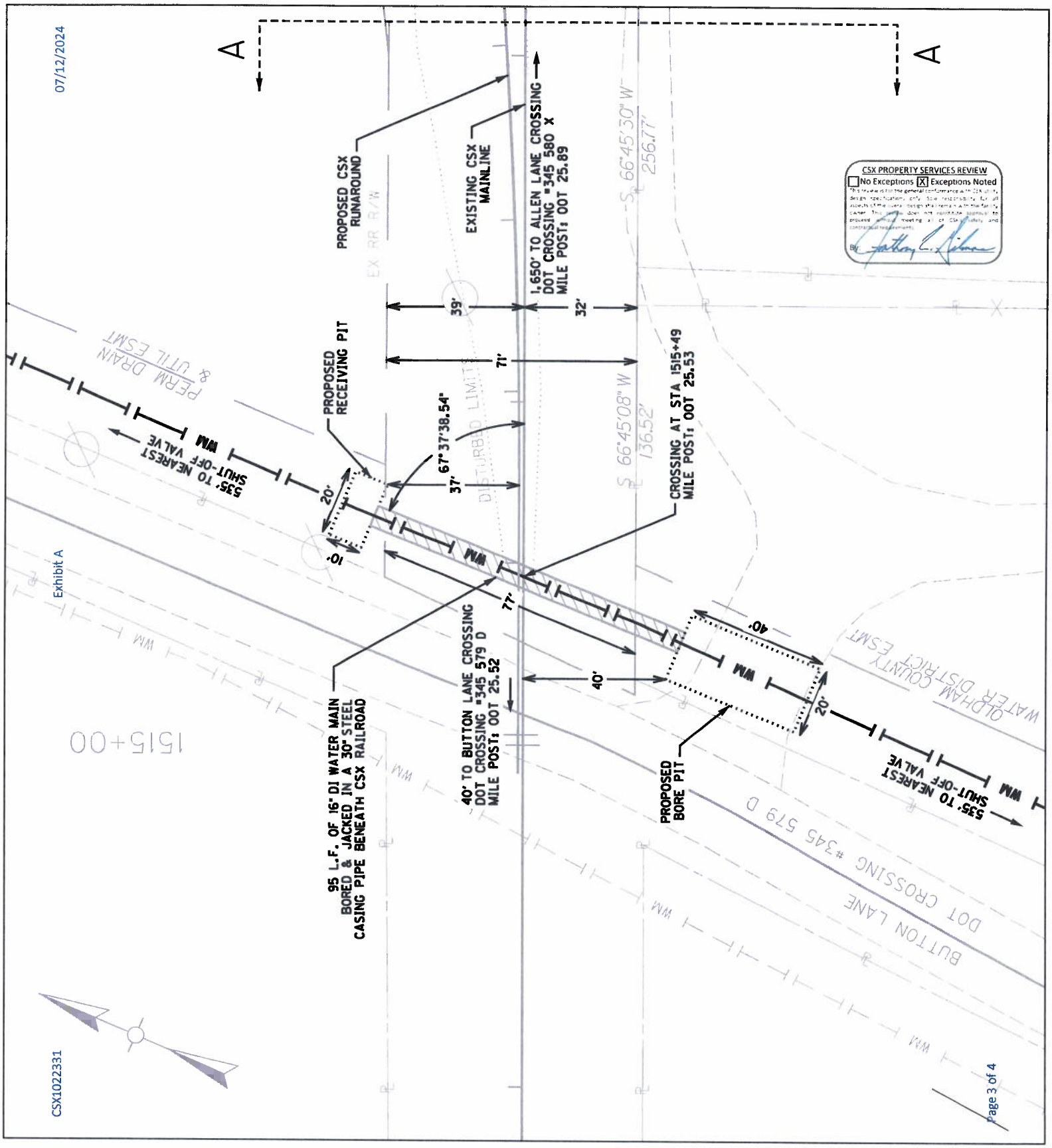
23) For any excavations permitted on CSXT property, all backfill in excavations and trenches shall be compacted to 95% maximum dry density as defined in ASTM standard d1557 and installed in six-inch lifts. In-situ soil shall be used for backfill material. Should additional offsite backfill material be needed, offsite material sources are to meet state and residential clean fill requirements and be preapproved by CSXT's representative. CSXT does not require a specific testing requirement or standard for stone.

24) Track monitoring: prior to commencing jack & bore operations, contractor shall be required to conduct and submit a baseline survey along the top of each rail under CSXT flagger protection and in accordance with the preapproved settlement monitoring construction submittal. Additional survey data shall be collected and submitted once each day during casing pipe installation, or as directed by CSXT representative. Contractor shall also take elevation shots at top of tie and top of casing pipe before starting the bore to verify depth of cover proposed for the work has been met.

25) Projects that generate soils from CSXT property must adhere to CSXT's soil management policies. CSXT requires soils generated from its property to either be reused on CSXT property or properly disposed in a CSXT approved disposal facility. CSXT environmental department will handle waste characterization and profiling into an approved disposal facility. CSXT prohibits any environmental sampling on its property unless granted through a written environmental right-of-entry or approved in writing by the CSXT environmental department. The management of soils generated from CSXT property should be planned for and properly permitted (if applicable) prior to initiating any work on CSXT property. A list of CSXT approved laboratories and/or disposal facilities may be obtained from the CSXT manager environmental pro

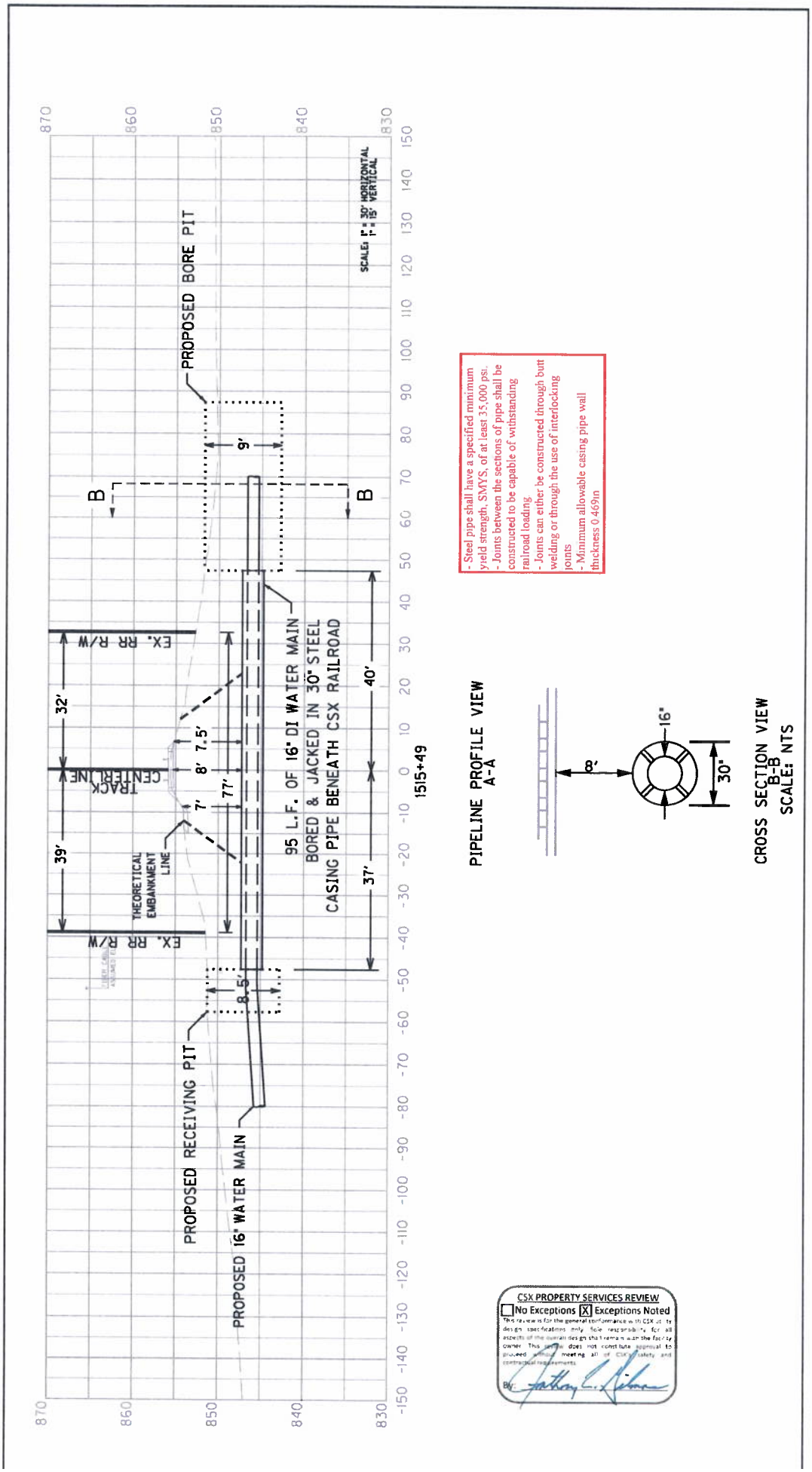
26) CSXT does not represent or warrant the right-of-way dimensions depicted on these drawings. A third party survey is recommended for verification and accuracy.

27) Upon completion of project construction, contractor must submit to CSXT the as-built plans showing the final alignment on CSXT property, including actual depth of facility and any field change to location on CSXT property, pipe materials, number of innerducts, etc.


07/12/2024
A
A
PROPOSED CSX RUNAROUND
EXISTING CSX MAINLINE
1,650' TO ALLEN LANE CROSSING DOT CROSSING "345 580 X MILE POST: OOT 25.89
CSX PROPERTY SERVICES REVIEW
No Exceptions
Exceptions Noted
39'
32'
71'
PROPOSED RECEIVING PIT
67° 37'38.54"
37'
DISTURBED LIMITS
S 66°45'30" W
256.77'
S 66°45'08" W
136.52'
CROSSING AT STA 1515+49 MILE POST: OOT 25.53
535' TO NEAREST SHUT-OFF VALVE
20'
10'
77'
95 L.F. OF 16" DI WATER MAIN BORED & JACKED IN A 30" STEEL CASING PIPE BENEATH CSX RAILROAD
40' TO BUTTON LANE CROSSING DOT CROSSING "345 579 D MILE POST: OOT 25.52
40'
40'
20'
PROPOSED BORE PIT
535' TO NEAREST SHUT-OFF VALVE
PERM DRAIN & UTIL ESMT
OLDHAM COUNTY WATER DISTRICT ESMT
BUTTON LANE DOT CROSSING #345 579 D
1515+00
Exhibit A
CSX1022331
Page 3 of 4

07/12/2024

Exhibit A



CSX1022331

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SECTION 330524 – HORIZONTAL DIRECTIONAL DRILLING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment and services required to utilize the trenchless technology of horizontal directional drilling (HDD) for the installation of below grade piping and appurtenances as specified herein. Where open cut excavation is required, refer to Specification Section 331113. Work shall include, but not be limited to, proper installation, testing, and restoration of the site and damaged underground utilities. Installation procedures shall be in accordance with the approved North American Society for Trenchless Technology (NASTT) "HDD Good Practices Guideline".

B. The HDD piping shall be is HDPE DR11, AWWA C900 pipe. The HDPE shall be DRISCOPLEX PE 4710 HDPE (DR11) pipe as manufactured by Chevron Philips Chemical Company, Inc. (formerly Philips Product Company), JM Eagle PE 4710 HDPE Water/Sewer (DR11) pipe as manufactured by J-M Manufacturing Company, Inc., ISCO PE 4710 HDPE (DR11) pipe as manufactured by ISCO Industries, LLC, or Engineer approved equal.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this Section.

B. Piping is specified in Division 33 Specification sections.

1.3 EXISTING CONDITIONS

A. The existing piping and other utilities shown on the Contract Drawings is based on the best available information. The Engineer makes no guarantee as to the accuracy of the locations or type of piping or utility depicted. All new piping which ties into existing lines must be made compatible with that piping.

B. So that piping conflicts may be avoided, Contractor shall locate the utility (vertically and horizontally) well ahead of the pipe laying operation to confirm exact locations of existing piping before installing any new piping.

C. Contractor shall provide all fittings and adapters necessary to complete all connections to existing piping.

1.4 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 013323.

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.

C. Work Plan - Prior to beginning work, the Contractor must submit to the Engineer an HDD Work Plan outlining the procedure and schedule to be used to execute the project. Work Plan should be realistic and document the thoughtful planning required to successfully complete the project, based on the actual working conditions anticipated for this project. The HDD Work Plan should include a description of:

1. All equipment to be used including drill rigs, down-hole tools, drilling heads, electronic guidance system, and fusing or coupling equipment.
2. Drilling materials and mud system, including drilling additives and drilling fluid mixtures.
3. A list of personnel and their qualifications and experience (including backup personnel in the event an individual is unavailable).
4. A list of subcontractors and identification of subcontractor work tasks.
5. A schedule of work activity including detailing work crews, scheduling of pull-ins, material deliveries and other required work tasks.
6. A safety plan (including MSDS of any potentially hazardous substances to be used).
7. An environmental protection plan.
8. The location of the drill rig setups at the entry and exit points.
9. Groundwater control and dewatering procedures.
10. Calculations showing the anticipated pull-in forces for each section to be installed, and verification that the pull-in forces and critical buckling forces are acceptable for the pipe material specified.
11. Material lay-down area plans.
12. Drilling mud disposal plan.
13. Contingency plans for possible problems including overstressing pipe during pull-in, pipe/coupling failure or damage during pull-in, unanticipated obstructions during drilling, pilot hole collapse, drilling mud blowouts, surface settlement and/or surface heaving, and drilling rig breakdowns.
14. The methodology to be used to connect pipe sections which are directionally drilled. The methodology shall include, at a minimum, discussions of:

    a. How, when and where the pipes will be fused (on grade).
    b. How the bore hole will be developed and how horizontal and vertical alignment control of the bore will be maintained.
    c. How the pipe will be installed in the bore hole.
    d. How any buried utility conflicts (if any) over the top of the bored pipe will be dealt with.

15. A plan for dealing with thermal expansion and contraction during and after construction. The anticipated operating range of the pipe and water within the pipe will be from 32 degrees F to 70 degrees F. The plan should include calculations showing the maximum expansion and contraction and a listing of anchors and restraints intended to be used and where they will to be installed.
16. A plan for disposal of excess excavated material and groundwater collected during drilling. Disposal methods shall comply with local, County, State and Federal requirements.

D. Equipment - The Contractor shall submit specifications on directional drilling equipment to be used to ensure that the equipment will be adequate to complete the project including but not limited to the following: drilling rig and drilling rods, drilling head and back-reamers, drilling materials and additive fluids, mud system (including mud motors and recovery systems, if applicable), downhole tools, electronic guidance system, pipe fusion or joining systems, and rig safety systems. Calibration records for guidance systems shall be included indicating that calibration has been performed within 6 months of start of drilling.

1.5 QUALITY ASSURANCE

A. The requirements set forth in this document specify a wide range of procedural precautions necessary to ensure that the very basic, essential aspects of a proper directional bore installation are adequately controlled. Strict adherence shall be required under specifically covered conditions outlined in this specification. Adherence to the specifications contained herein, or the Engineer's approval of any aspect of any directional bore operation covered by this specification, shall in no way relieve the Contractor of their ultimate responsibility for the satisfactory completion of the work authorized under the Contract.

B. Use of horizontal directional drilling for installation piping specified in Division 33 hereinafter shall be in Division 33 hereinafter accordance with the latest revision of ASTM F-1962.

PART 2 - PRODUCTS

2.1 EQUIPMENT

A. The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pullback the pipe, a mixing and delivery system for drilling fluid of sufficient capacity to successfully complete the installation, a guidance system to accurately guide boring operations, control and containment of drilling fluid, along with trained and competent personnel to operate the system. All equipment shall be in good, safe operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of the project.

2.2 DRILLING SYSTEM

A. Drilling Rig - The directional drilling machine shall consist of a hydraulically powered system to rotate, push and pull hollow drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The machine shall be anchored to the ground to withstand the pulling, pushing and rotating pressure required to complete the installation. The hydraulic power system shall be self-contained with sufficient pressure and volume to power drilling operations. Hydraulic system shall be free of leaks. Rig shall have a system to monitor and record maximum pull-back pressure during pull-back operations. There shall be a system to detect electrical current from the drill string and have an audible alarm that automatically sounds when an electrical current is detected.

B. Drill Head - The drill head shall be steerable by changing its rotation and shall provide the necessary cutting surfaces and drilling fluid jets.

C. Mud Motors (if required) - Mud motors shall be of adequate power to turn the required drilling tools.

D. The drilling equipment shall be capable of providing continuous support to the drilled void through the application of pressure to the drilling fluid and the selection of appropriate drilling fluids to "bind" the soil.

2.3 GUIDANCE SYSTEM

A. The Contractor shall supply all components and materials to install, operate, and maintain the guidance system.

B. The entry angle for all HDD operations shall be 12 degrees from horizontal (0.21255 ft/ft).

C. A Magnetometer-accelerometer type Guidance System (MGS) probe or proven (non-experimental) gyroscopic probe and interface shall be used to provide a continuous and accurate determination of the location of the drill head during the drilling operation. The guidance system shall enable the driller to continuously guide the drill head by providing immediate information at the tool face, azimuth (horizontal) and inclination (vertical) directions. The guidance system shall be accurate and calibrated to manufacturer's specifications. The vertical location of the tool referenced to USGS elevations shall be capable of being continuously determined. The Contractor shall include the cost of additional survey and guidance systems necessary to achieve specified accuracy.

D. The MGS and wire line tracking system shall be set up and operated by personnel trained and experienced with the system. The Contractor shall be aware of any geo-magnetic anomalies and shall consider such influences in the operation if using a magnetic guidance system.

E. The accuracy of the bore path and resulting pipe profile centerline shall be within 4 feet left or right horizontally of the specified water main alignment and within 2 percent above or below the specified water main profile in any soil or rock condition. The exit point for the bore path and HDD water main shall be within a tolerance of 5 feet short of or 10 feet past the specified exit point.

F. The Contractor shall provide the Engineer with real-time readings from the wire line tracking system to verify the bore path is within the specified accuracy limits prior to pipe pull-back. Real-time readings will be read by the Contractor and Engineer from the tracking system during installation.

2.4 DRILLING FLUID (MUD) SYSTEM

A. Mixing System - A self-contained, closed, drilling fluid mixing system shall be of sufficient size to mix and deliver drilling fluid composed of bentonite clay, potable water and appropriate additives. Mixing system shall be able to molecularly shear individual bentonite particles from the dry powder to avoid clumping and ensure thorough mixing. The drilling fluid reservoir tank shall be sized for adequate storage of the mud mixture. Mixing system shall continually agitate the drilling fluid during drilling operations.

B. Drilling Fluids - Drilling fluid shall be composed of clean water and bentonite clay, utilized as required for the drilling conditions encountered. Water shall be from a clean source with a pH of 8.5 - 10 and/or as per mixing requirements of the manufacturer. Water of a lower pH or with excessive calcium shall be treated by the Contractor with the appropriate amount of sodium carbonate or equal at no additional cost. The water and additives shall be mixed thoroughly and be absent of any clumps or clods. Drilling fluid shall be maintained at a viscosity sufficient to suspend cuttings and maintain the integrity of bore wall. Additives shall be utilized as required for the drilling conditions encountered. No hazardous additives may be used.

C. Delivery System - The mud pumping system shall have a minimum capacity to supply mud in accordance with the drilling equipment pull-back rating at a constant required pressure. The delivery system shall have filters in-line to prevent solids from being pumped into the drill pipe. Connections between the pump and drill pipe shall be relatively leak-free. Used drilling fluid and drilling fluid spilled during drilling operations shall be contained and properly disposed of. A spill protection berm, minimum of 12 inches high and large enough to contain spills up to 1000 gallons, shall be maintained around drill rigs, drilling fluid mixing system, entry and exit pits, and drilling fluid recycling system (if used) to prevent spills into the surrounding environment. Pumps and or vacuum truck(s) of sufficient size shall be in place to convey excess drilling fluid from containment areas to storage, recycling, or disposal facilities.

2.5 OTHER EQUIPMENT

A. Pipe Rollers and Supports - Pipe rollers and supports shall be used for pipe assembly and during final pipe pull-back whenever the pipe lengths of 10 feet or more occur. Rollers and supports shall be capable of supporting the pipe materials uniformly and shall be equipped with rollers or other low friction systems which do not materially increase pull-back forces. Rollers and supports shall be designed and installed to prevent the pipe from falling off the sides or lifting due to sharp bends either vertically or horizontally. Systems shall be designed to account for pipe twisting/rotation during pull-back.

B. Pipe Rammers - Hydraulic or pneumatic pipe rammers may only be used if necessary and with the authorization of Engineer.

C. Restrictions - Other devices or utility placement systems for providing horizontal thrust other than those previously defined in the preceding sections shall not be used unless approved by the Engineer prior to commencement of the work. Consideration for approval will be made on an individual basis for each specified location. The proposed device or system will be evaluated prior to approval or rejection on its potential ability to complete the utility placement satisfactorily without undue stoppage and to maintain line and grade within the tolerances prescribed by the particular conditions of the project.

2.6 PERSONNEL REQUIREMENTS

A. All personnel shall be fully trained in their respective duties as part of the HDD crew and in safety. All drill rig and fluid mixing operators must have at least two years direction drilling experience with the equipment used for this project.

B. A competent and experienced Supervisor with a minimum of five years of experience in directional drilling shall be provided by the Contractor. The Supervisor shall be thoroughly

familiar with the equipment and type of the work to be performed and must be directly in charge and control of the operation at all times during the actual drilling operations.

C. The personnel operating the fusion equipment for HDPE pipe shall have at least five years of experience with fusion equipment and shall be certified by the pipe or fusion equipment manufacturer. Personnel who are unqualified, incompetent, or otherwise not suitable for the performance of this project shall be removed from the job site and replaced with suitable personnel.

2.7 COUPLINGS, FITTINGS AND PIPE JOINTS

A. All HDPE pipe and fittings shall be made of a high-density polyethylene pipe compound with extra high molecular weight that meets the requirements for Type III, Grade P34 polyethylene material as defined in ASTM D1248.

B. Pipes shall be joined to one another and to polyethylene fittings by thermal butt-fusion or by socket fusion in accordance with ASTM D3261. The tensile strength at yield of the butt-fusion joints shall not be less than the pipe. A specimen of pipe cut across the butt-fused joint shall be tested in accordance with ASTM D638.

C. Joining of pipe sections shall be performed in accordance with the procedures recommended by the pipe manufacturer. Joints between pipe sections shall be smooth on the inside and thermal projection beads shall not be greater than 3/16-inch.

PART 3 -EXECUTION

3.1 PREPARATION

A. The Engineer must be notified 48 hours in advance of starting work. The Engineer's approval for beginning the installation shall in no way relieve the Contractor of the ultimate responsibility for the satisfactory completion of the work as authorized under the Contract. It shall be the responsibility of Engineer to provide inspection personnel at such times as appropriate.

B. The Contractor shall be fully responsible for all damages resulting from their failure to comply with all applicable state, federal and local regulations, and requirements of these specifications.

C. The Contractor shall provide all material, equipment, and facilities required for directional drilling. Proper alignment and elevation of the borehole shall be consistently maintained throughout the directional drilling operation.

D. The entire drill path shall be accurately surveyed by the Contractor with entry, exit, and connection stakes placed prior to commencement of drilling the intended entry, exit, and connection points. The drill path shall be surveyed by the Contractor for any surface geo-magnetic variations or anomalies.

E. If obstructions to the drilling operations are encountered, the Contractor is responsible for investigating and resolving obstructions within requirements of these specifications, permits obtained for this project, and appropriate authority's regulations.

F. The Contractor shall place filter sock between all drilling operations and any surface drainage paths, wetlands, waterways, or other similar areas. Additional environmental protection necessary to contain hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains, and other measures.

G. The Contractor shall provide adequate supplies of pipe, drilling fluids, drilling rods, water, pipe supports and rollers, and fuel to allow continuous operations to be maintained once operations begin. Problems resulting from failure of the Contractor to maintain continuous operations shall not be cause for additional compensation or time.

3.2 GENERAL

A. Location readings shall be recorded after advancement of each successive drill pipe (no more than 20-foot intervals) and the readings plotted on the field copy of the plan and profile drawings. Vertical alignment shall be shown based on true elevation as determined by survey and not referenced from the surface grade. Access to all recorded readings and plan and profile information shall be made available to the Engineer and the Owner at all times.

B. All drilling fluids and loose cuttings shall be contained in pits or holding tanks for recycling or disposal at the Contractor's option. No fluids shall be allowed to enter any unapproved areas or natural waterways. During and following completion of directional drilling operations, the drilling mud and cuttings shall be disposed of by the Contractor at an approved dumpsite.

C. The deflection radius of the installed pipeline shall not exceed 70 percent of the minimum allowable bend radius allowed by the pipe manufacturer.

D. The Contractor shall take precautions to ensure settlement or heaving of surface or underground structures above directional drilling operations will not occur. For grade sensitive features such as railroad tracks, levee crossings, and sewers, an existing conditions survey shall be performed to document existing conditions. The existing conditions survey shall include detailed topographical survey of all features which may be affected by the proposed work such as ground surface, pavement surface, railroad ties, ballast and tracks, signals, or other cast in place structures, manholes, sewers, overhead utility poles, and other surface or subsurface features within 10 feet horizontally of the proposed alignment. Evidence that voids are being created, subsidence is occurring, or puncture/damage to underground utilities is occurring will be sufficient cause to require remedial action without additional compensation.

E. Protect all existing utilities, site objects, and new work, which are to remain in service.

F. Reroute around or excavate and remove obstacles and debris blocking progress of drilling, including but not limited to, cobbles, boulders, timbers, construction debris, concrete spillage from previous construction, abandoned utilities discovered during installation, and unused piling or caissons. The Contractor shall properly cap, plug, or bulkhead abandoned utilities which are discovered.

3.3 DRILLING PROCEDURE

A. Site Preparation - Prior to any alterations to work-site, Contractor shall photograph or video tape entire work area, including entry and exit points. One copy shall be given to the Engineer and one copy to remain with Contractor for a period of one year following the completion of the project. Work site as indicated on drawings, within right-of-way, shall be graded or filled to provide a level working area. No alterations beyond what is required for operations are to be made. Contractor shall confine all activities to designated work areas.

B. Drill Path Survey - Entire drill path shall be accurately surveyed with entry and exit stakes placed in the appropriate locations within the areas indicated on drawings. If Contractor is using a magnetic guidance system, drill path will be surveyed for any surface geomagnetic variations or anomalies.

C. Environmental Protection - Contractor shall have in place silt fence between all drilling operations and any drainage, wetland, waterway or other area designated for such protection by contract documents, state, federal and local regulations. Additional environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. Contractor shall adhere to all applicable environmental regulations. Also, all erosion control facilities shall be in accordance with Specification Section 312500, hereinafter, and the standard detail drawing for erosion control included in the contract drawings.

D. Safety - Contractor shall adhere to all applicable state, federal and local safety regulations and all operations shall be conducted in a safe manner. Safety meetings shall be conducted at least weekly with a written record of attendance and topic submitted to Engineer.

3.4 PILOT HOLE INSTALLATION

A. The pilot hole shall be drilled on the bore path with no deviations at any point greater than the specified accuracy vertically and horizontally. The pilot hole on the bore path shall not deviate more than 2 percent of the depth or one foot horizontally over the length of the bore. If the pilot hole does deviate from the bore path more than specified, vertically or horizontally at any point, Contractor shall notify Engineer. Engineer may require Contractor to pull-back and re-drill from the location along the bore path before the deviation if design alterations are not possible. In the event of a drilling fluid fracture or blowout, inadvertent returns, or returns lost during pilot hole drilling operations, Contractor shall cease drilling and take immediate steps to resolve the problem. If Contractor is unable to resolve problem in existing pilot hole, redrilling may be required at no additional cost. Contractor shall discuss re-drilling options with Engineer and work shall proceed as agreed.

B. Upon completion of pilot hole phase of the operation, an initial set of "As-Built" Record Drawings in electronic format shall be submitted to the Engineer and Owner within 1 working day of pilot hole completion. These drawings shall include the pilot hole bore path plan and profile within 0.25 feet at 25-foot intervals, as well as locational survey reports as recorded during drilling operations.

C. Engineer and Owner will review pilot hole information and determine if the location and elevation of the pilot hole are suitably close to the designed alignment and will complete this review within 1 working day following receipt from Contractor. Should Contractor decide the

initiate the hole enlarging phase of the operation prior to approval of the pilot hole, Contractor shall bear all risk for incorporating alterations requested following review of the pilot hole information by Engineer or Owner.

3.5 PIPE INSTALLATION

A. Upon approval of the pilot hole alignment by the Engineer and Owner, the hole opening or enlarging phase of the installation shall begin. The bore hole diameter shall be increased to accommodate the pull-back operation of the required carrier pipe. The type of hole opener or back reamer to be utilized shall be determined by the Contractor based on the types of subsurface rock and soil conditions encountered during the pilot hole drilling operation. The Contractor shall select the proper reamer type with the final hole opening being a maximum of 1.5 times the largest outside diameter pipe system component to be installed in the bore hole.

B. The open bore hole shall be stabilized by means of bentonite drilling slurry pumped through the inside diameter of the drill rod and through openings in the reamer. The drilling slurry must be in a homogenous, flowable state serving as an agent to carry the loose cuttings to the surface through the annulus of the borehole. The volume of bentonite mud required for each pull-back shall be calculated based on soil/rock conditions, largest diameter of the pipe system component, capacity of the bentonite mud pump, and the speed of pull-back as recommended by the bentonite drilling mud manufacturer. The bentonite slurry shall be contained at the exit or entry site of the directional bore in pits or holding tanks. The slurry may be recycled at this time for reuse in the hole opening operation or shall be hauled by the Contractor to a disposal site approved by the Engineer or Owner.

C. The pipe sections shall be joined together according to the pipe manufacturer's specifications. Butt fused joints shall be true alignment and shall have uniform roll-back beads resulting from proper temperature and pressure. Joints shall be allowed adequate cooling time before removal of pressure. Joints shall be watertight and have strength equal to that of the adjoining pipe sections.

D. A pulling eye shall be attached to a pipe pulling head on the lead section of pipe which in turn shall be attached to a swivel on the end of the drilling pipe.

E. Tracer wire shall not be required for HDD portions of the water main.

F. The pipe shall be elevated to the approximate angle of entry and supported by means of rollers and supports, to allow for the "free stress" situation as the pipe is pulled into the exit hole toward the drill rig. The pull-back phase of the HDD operation shall be carried out in a continuous manner until the pipe reaches the original entry side of the bore. The annular space between the pipe and the bore hole shall be filled with the bentonite mud to support and stabilize the pipe. The Contractor shall use caution to ensure that the pressure of the bentonite mud does not distort or collapse the pipe.

G. The pipe shall be ballasted during pull-back by completely filling the inside diameter of the pipe with water.

3.6 JOINING TO ADJACENT PIPE SECTIONS

A. When adjacent sections of HDD pipe are to be connected to each other, the Contractor shall excavate a sufficiently large area so that the adjoining sections of pipe can be installed without sags or humps so there are no high points created.

B. Excess pipe lengths from drilling operations shall be cut off accurately to connect to adjoining sections with a single coupling or butt fuse.

C. Trenching and backfilling operations shall comply with Specification Section 331113.

3.7 PIPE HANDLING

A. Care shall be taken during transportation of the pipe such that it will not be cut, kinked, or otherwise damaged.

B. Ropes, fabric, or rubber protected slings and straps shall be used when handling pipes. Chains, cables, and hooks inserted into the pipe ends shall not be used. Two slings spread apart shall be used for lifting each length of pipe. Pipe and pipe fittings shall not be dropped onto the ground.

C. Pipes shall be stored in accordance with manufacturer's recommendations on level ground, free of sharp objects that could damage the pipe. Stacking pipe shall only occur when manufacturer's shipping system is utilized which will not cause deformation of the bottom layers of pipe under anticipated temperature conditions.

D. The handling of the assembled pipeline shall be in such a manner that the pipe is not damaged by dragging it over sharp or cutting objects. Slings for handling of the pipeline shall not be positioned at pipe joints. Sections of the pipe with cuts and gouges or excessive deformation shall be removed and replaced.

3.8 TESTING AND INSPECTION

A. Leakage inspection - Perform a preliminary leakage test after each HDD pipe has been fused together for its entire length. Each connected length shall be successfully tested prior to installation by air pressure to 5 psi. The test pressure shall be held for a minimum duration of 15 minutes. The Contractor shall expect and allow for some straightening of the pipe in the laydown area during pressure testing without damage occurring to the pipe.

B. The Contractor shall perform a secondary leakage test immediately after installing each entire HDD pipe into place. This test shall meet the requirements for leakage and deflection in accordance with Specification Section 331113.

C. The Contractor shall perform a final leakage test once all pipe sections have been connected to the pipe water mains prior to and following the HDD portion of the project. The Contractor shall repair all visible or detected leaks.

D. Hydrostatic testing of the HDD pipe shall be performed in accordance with Specification Section 331113.

3.9 SITE RESTORATION

A. Following HDD operations, the Contractor shall demobilize equipment and restore the work sites to their original conditions. All temporary fencing, berms, excess piping and other items used during the HDD operation shall be removed from the work sites.

B. All excavations shall be backfilled and compacted to not less than 95 percent of original density. All drilling mud shall be disposed of by the Contractor.

END OF SECTION 330524

SECTION 331113 – WATER DISTRIBUTION PIPING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment and services required for furnishing and installing all piping and appurtenances specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Valves - Utility Services: Section 331216

B. Horizontal Directional Drilling: Section 330524

1.3 SUBMITTALS

A. A notarized certification shall be furnished for all pipe and fittings that verifies compliance with all applicable specifications.

B. The requirement for this certification does not eliminate the need for shop drawings submittals in compliance with Section 013323.

C. In accordance with the requirements of the General and Special Conditions and this Section, the following table includes, but is not limited to, the items required to be submitted:

Item Description	Shop Drawings	Product Data	Schedules	Installation Data	Parts Lists	Wiring Diagram	Samples	O & M Manual	Certificates	Warranty	Report	Other
Pipe and Fittings		X							X			
Couplings and Adapters		X										
Detectable UG Tape		X		X								
Tracer Wire		X		X								
Trench Baffles		X		X								
PE Tubing		X										
Corp. Stops and Fittings		X		X								

1.4 EXISTING CONDITIONS

A. The existing piping shown on the Contract Drawings is based on the best available information. The Engineer makes no guarantee as to the accuracy of the locations or type of piping depicted. All new piping which ties into existing lines must be made compatible with that piping.

B. So that piping conflicts may be avoided, Contractor shall open up his trench well ahead of the pipe laying operation to confirm exact locations of existing piping before installing any new piping.

C. Contractor shall provide all fittings and adapters necessary to complete all connections to existing piping.

1.5 UTILITY LINE ACTIVITIES COVERED UNDER NATIONWIDE PERMIT # 12

A. All activities involving utility line construction covered under the US Army Corps of Engineers NATIONWIDE PERMIT # 12 shall meet the following conditions:

1. Utility Line Activities. Activities required for the construction, maintenance, repair, and removal of utility lines and associated facilities in waters of the United States, provided the activity does not result in the loss of greater than 1/2 acre of waters of the United States for each single and complete project. Utility lines: This NWP authorizes the construction, maintenance, or repair of utility lines, including outfall and intake structures, and the associated excavation, backfill, or bedding for the utility lines, in all waters of the United States, provided there is no change in pre-construction contours. This NWP also authorizes temporary structures, fills, and work necessary to conduct the utility line activity.

2. Appropriate measures must be taken to maintain normal downstream flows and minimize flooding to the maximum extent practicable, when temporary structures, work, and discharges, including cofferdams, are necessary for construction activities, access fills, or dewatering of construction sites. Temporary fills must consist of materials and be placed in a manner that will not be eroded by expected high flows. Temporary fills must be removed in their entirety and the affected areas returned to pre-construction elevations. The areas affected by temporary fills must be revegetated, as appropriate.

3. Notification: The permittee must submit a pre-construction notification to the US Army Corps district engineer prior to commencing the activity if any of the following criteria are met: (1) The activity involves mechanized land clearing in a forested wetland for the utility line right-of-way; (2) a section 10 permit is required; (3) the utility line in waters of the United States, excluding overhead lines, exceeds 500 feet; (4) the utility line is placed within a jurisdictional area (i.e., water of the United States), and it runs parallel to or along a stream bed that is within that jurisdictional area; (5) discharges that result in the loss of greater than 1⁄10-acre of waters of the United States; (6) permanent access roads are constructed above grade in waters of the United States for a distance of more than 500 feet; or (7) permanent access roads are constructed in waters of the United States with impervious materials.

B. All activities involving utility line construction covered under KENTUCKY GENERAL CERTIFICATION of Nationwide Permit # 12 shall meet the following conditions:

The general Water Quality Certification applies to surface waters of the Commonwealth as defined in 401KAR10:001 Chapter 10, Section 1(80): Surface waters mean those waters having well-defined banks and beds, either constantly or intermittently flowing, lakes and impounded waters; marshes and wetlands; and any subterranean waters flowing in well-defined channels and having a demonstrable hydrologic connection with the surface.

1. The activity will not occur within surface waters of the Commonwealth identified by the Kentucky Division of Water as Outstanding State or National Resource Water, Cold Water Aquatic Habitat, or Exceptional Waters.

2. The activity will not occur within surface waters of the Commonwealth identified as perpetually protected (e.g. deed restriction, conservation easement) mitigation sites.

3. This general water quality certification does not authorize the installation of utility lines in a linear manner within the stream channel or below the top of the stream bank.

4 For a single crossing, impacts from the construction and maintenance corridor in surface waters shall not exceed 50 feet of bank disturbance.

5. This general certification shall not apply to nationwide permits issued for individual crossings which are part of a larger utility line project where the total cumulative impacts from a single and complete linear project exceed ½ acre of wetlands or 300 linear feet of surface waters. Cumulative impacts include utility line crossings, permanent or temporary access roads, headwalls, associated bank stabilization areas, substations, pole or tower foundations, maintenance corridor, and staging areas.

6. Stream impacts under Conditions 4 and 5 of this certification are defined as the length of bank disturbed. For the utility line crossing and roads, only one bank length is used in calculation of the totals.

7 Stream impacts covered under this General Water Quality Certification and undertaken by those persons defined as an agricultural operation under the Agricultural Water Quality Act must be completed in compliance with the Kentucky Agricultural Water Quality Plan (KWQP).

8. The Kentucky Division of Water may require submission of a formal application for an individual certification for any project if the project has been determined to likely have a significant adverse effect upon water quality or degrade the waters of the Commonwealth so that existing uses of the water body or downstream waters are precluded.

9. Activities that do not meet the conditions of this General Water Quality Certification require an Individual Section 401 Water Quality Certification.

10. Blasting of stream channels, even under dry conditions, is not allowed under this general water quality certification.

11. Utility lines placed parallel to the stream shall be located at least 50 feet from an intermittent or perennial stream, measured from the top of the stream bank. The cabinet may allow construction within the 50-foot buffer if avoidance and minimization efforts are shown and adequate methods are utilized to prevent soil from entering the stream.

12. Utility line stream crossings shall be constructed by methods that maintain flow and allow for a dry excavation. Water pumped from the excavation shall be contained and allowed to settle prior to re-entering the stream. Excavation equipment and vehicles shall operate outside of the flowing portion of the stream. Spoil material from the excavation shall not be allowed to enter the flowing portion of the stream.

13. The activities shall not result in any permanent changes in pre-construction elevation contours in surface waters or wetlands or stream dimension, pattern or profile.

14. Utility line activities which impact wetlands shall not result in conversion of the area to non-wetland status. Mechanized land clearing of forested wetlands for the installation or maintenance of utility lines is not authorized under this certification.

15. Activities qualifying for coverage under this General Water Quality Certification are subject to the following conditions:
    a. Erosion and sedimentation pollution control plans and Best Management Practices must be designed, installed, and maintained in effective operating condition at all times during construction activities so that violations of state water quality standards do not occur.
    b. Sediment and erosion control measures, such as check-dams constructed of any material, silt fencing, hay bales, etc., shall not be placed within surface waters of the Commonwealth, either temporarily or permanently, without prior approval by the Kentucky Division of Water's Water Quality Certification Section. If placement of sediment and erosion control measures in surface waters is unavoidable, design and placement of temporary erosion control measures shall not be conducted in such a manner that may result in instability of streams that are adjacent to, upstream, or downstream of the structures. All sediment and erosion control devices shall be removed and the natural grade restored within the completion timeline of the activities.
    c. Measures shall be taken to prevent or control spills of fuels, lubricants, or other toxic materials used in construction from entering the watercourse.
    d. Removal of riparian vegetation shall be limited to that necessary for equipment access.
    e. To the maximum extent practicable, all in-stream work under this certification shall be performed under low-flow conditions.
    f. Heavy equipment, e.g. bulldozers, backhoes, draglines, etc., if required for this project, should not be used or operated within the stream channel. In those instances, in which such in-stream work is unavoidable, then it shall be performed in such a manner and duration as to minimize turbidity and disturbance to substrates and bank or riparian vegetation.
    g. Any fill shall be of such composition that it will not adversely affect the biological, chemical, or physical properties of the receiving waters and/or cause violations of water quality standards. If riprap is utilized, it should be of such weight and size that bank stress or slump conditions will not be created because of its placement.
    h. If there are water supply intakes located downstream that may be affected by increased turbidity and suspended solids, the permittee shall notify the operator when such work will be done.
    i. Should evidence of stream pollution or jurisdictional wetland impairment and/or violations of water quality standards occur as a result of this activity (either from a spill or other forms of water pollution), the Kentucky Division of Water shall be notified immediately by calling (800) 928-2380.

16. Non-compliance with the conditions of this general certification or violation of Kentucky state water quality standards may result in civil penalties.

1.6 CONSTRUCTION IN A FLOODPLAIN

A. No material shall be placed in the stream or in the flood plain to form construction pads, coffer dams, access roads, etc. unless prior approval has been obtained from the Environmental and Public Protection Cabinet.

B. The trench shall be backfilled as closely as possible to the original contour. All excess material from construction of the trench shall be disposed of outside the flood plain unless the applicant has received prior approval from the Cabinet to fill within the flood plain.

PART 2 - PRODUCTS

2.1 DUCTILE IRON PIPE AND FITTINGS

A. Ductile iron pipe shall conform to ANSI/AWWA C151/A21.51, latest revision, pressure class 350, with push-on joints unless otherwise noted on Drawings.

B. The interior of the pipe shall be cement-mortar lined with bituminous seal coat in accordance with ANSI/AWWA C104/A21.4, latest revision. Thickness of the lining shall be as set forth in the ANSI/AWWA C104/A21.4 specification unless otherwise directed by the Engineer. The exterior of all pipe, unless otherwise specified, shall receive either coal tar or asphalt base coating a minimum of 1 mil thick.

C. Each piece of pipe shall bear the manufacturer's name or trademark, the year in which it was produced and the letters "DI" or the word "DUCTILE". Pipe manufacturer shall furnish notarized certificate of compliance to the above AWWA or ANSI specifications.

D. Fittings shall be pressure class 350 ductile iron and have mechanical-joints or push-on joints in accordance with ANSI/AWWA C110/A21.10, latest revision and shall conform to the details and dimensions shown therein. Fittings shall have interior cement-mortar lining as specified hereinbefore for the pipe. Compact ductile iron fittings meeting the requirements of ANSI/AWWA C153/A21.53, latest revision, will also be acceptable.

E. Joints for ductile iron pipe and fittings, as described hereinbefore, shall be rubber-gasket joints and be in accordance with ANSI/AWWA C111/A21.11, latest revision. Joints shall have the same pressure rating as the pipe or fitting of which they are a part. Joints shall be installed per the manufacturer's recommendations.

F. Provide ANSI/AWWA C110/A21.10 mechanical joint plugs and locked or restrained pipe joints where indicated on Drawings. Fittings under structures shall be mechanical joint with retainer glands.

2.2 HIGH DENSITY POLYETHYLENE PIPE

A. General: High density polyethylene pipe shall be DRISCOPLEX PE 4710 HDPE (DR11) pipe as manufactured by Chevron Philips Chemical Company, Inc. (formerly Philips Product Company), JM Eagle PE 4710 HDPE Water/Sewer (DR11) pipe as manufactured by J-M Manufacturing Company, Inc., ISCO PE 4710 HDPE (DR11) pipe as manufactured by ISCO Industries, LLC, or Engineer approved equal.

B. Materials for Polyethylene Pipe:

1. The polyethylene pipe and fittings shall be made of polyethylene resins classified in ASTM D 1248 as Type III, Category 5, Grade P34 (pipe designation PE 3408 defined per ASTM D 3035), having specific base resin densities of 0.941 g/cc minimum and 0.955 g/cc maximum respectively; and having melt index less than 0.15 grams/10 min.
2. Pipe made from these resins must have a long-term strength rating of 1,600 psi or more.
3. The polyethylene resin shall contain antioxidants and shall be stabilized with carbon black against ultra-violet degradation to provide protection during processing and subsequent weather exposure.
4. The polyethylene resin compound shall have a resistance to environmental stress cracking as determined by the procedure detailed in ASTM D 1693, Condition B with sample preparation by procedure C of not less than 200 hours.
5. Polyethylene shall have cell classification of 345464C as defined by ASTM 3350-05.

C. Polyethylene Pipe and Fittings:

1. The pipe shall be designed for a pressure rating of 200 psi (DR11).
2. Each length of pipe shall be marked, at no more than 10-foot intervals, with the following information:

    a. Nominal Pipe Size
    b. Type Plastic Material - PE3408
    c. Pipe Pressure Rating
    d. Manufacturer's Name, Trademark and Code

3. All pipes shall be made from virgin material. No rework compound.
4. Pipe shall be homogenous throughout, and be free of visible cracks, holes, foreign material, blisters, or other deleterious faults.
5. Fittings for the polyethylene pipeline shall be molded or fabricated from the same material as specified hereinbefore for the high-density polyethylene pipe.
6. Fittings for bends 22-1/2 degrees or greater shall be provided as shown on the Drawings. For alignment changes of less than 20 degrees deflection, the pipe may be laid in curves with a radius of 100 feet or greater.
7. All run-of-the-pipe fittings shall be fusion welded into the pipeline. Tee branches shall be of the size shown on the Drawings and shall be furnished with flanged ends per ANSI B-16.1. All fittings shall be factory-made.
8. Fittings shall be capable of withstanding the same pressure and loading conditions specified for the pipe.
9. Wye branches shall be true wyes.
10. The pipe shall be Iron Pipe Size (IPS).

D. Pipe Jointing:

1. Pipe to be joined by leakproof, thermal, butt fusion joints. All fusion must be done by personnel trained by the pipe supplier using tools approved by the pipe supplier.
2. The fusion machine shall have hydraulic pressure control for fusing 2 pipe ends together; it shall include pressure fusion indicating gauges to correctly monitor fusion pressures. The machines correctly monitor fusion pressures. The machines shall be equipped with an electric or gasoline engine powered facing unit to trim irregularities from the pipe ends. The heating plate on the fusion machine shall be electrically heated and thermostatically controlled and shall contain a temperature gauge for monitoring temperature.
3. Joint strength must be equal to that of adjacent pipe as demonstrated by tensile test. In addition, results of tensile impact testing of joint should indicate a ductile rather than a brittle fracture. The external appearance of fusion bead should be smooth without significant juncture groove.
4. Threaded or solvent cement joints and connections are not permitted.

E. Joining, Terminating or Adapting by Mechanical Means:

1. The polyethylene pipe shall be connected to systems or fittings of other materials by means of an assembly consisting of a polyethylene flange adapter butt-fused to the pipe, a backup ring of either cast iron, steel, or high silica aluminum alloy made to ANSI B-16.1 dimensional standards (with modified pressure ratings), bolts of compatible material (insulated from the fittings where necessary) and a gasket of reinforced black rubber, or other material approved by the Engineer, cut to fit the joint. In all cases, the bolts shall be drawing up evenly and in line.
2. Termination of valves, or fittings such as tees, bends, etc., made of other materials shall be by the flange assemblies specified hereinbefore. The pipe adjacent to these joints and to joints themselves must be rigidly supported for a distance of one pipe diameter or 1 foot, whichever is greater, beyond the flange assembly.
3. Appurtenances must be placed on their own foundations, unsupported by the pipe, in accordance with the detail plans.

F. Tools and Procedures:

1. Fusion jointing and other procedures necessary for correct assembly of the polyethylene pipe and fittings will be done only by personnel trained in those skills by the pipe supplier.
2. Only those tools designed for aforementioned procedures and approved by the pipe supplier shall be used for assembly of pipe and fittings to ensure proper installation.

2.3 MECHANICAL JOINT PIPE RESTRAINTS

A. Restrained Follower Glands for Ductile Iron Pipe: Restraint for standard mechanical joint fittings on ductile iron pipe shall be incorporated in the design of the follower gland and shall utilize multiple wedge segments that act against the pipe, increasing their resistance as the line pressure increases. The assembled joint shall maintain the maximum flexibility and deflection of all nominal pipe sizes after burial. Restraining gland, wedge segments, and actuating bolts shall be manufactured of high strength ductile iron conforming to the requirements of ASTM A536, Grade 65-45-12. Wedge segments shall be heat treated to a hardness of 370 BHN minimum. Dimensions shall be compatible with standardized mechanical joints conforming to

the requirements AWWA C111/ANSI A21.11 and AWWA C153/ANSI 21.53 (latest revision). Breakaway tops shall be incorporated in the design of the actuating bolts to visually ensure proper torque. The actuating bolts must ensure precise and consistent operating torque of the breakaway top. The design of the restraining device shall be such that the gland body evenly bears the stress of the restraining load. The mechanical joint restraining devices shall have a minimum working pressure rating of 350psi for sizes 3 inches - 12 inches and 250psi for 14 inches and larger and provide no less than a safety factor of 2:1. Restraint shall be UL Listed and FM approved in applicable sizes.

B. Restrained Follower Glands for HDPE Pipe: Restraint for standard mechanical joint fittings on HDPE shall be incorporated in the design of the follower gland and shall utilize multiple wedge segments that act against the pipe, increasing their resistance as the line pressure increases. The assembled joint shall maintain the maximum flexibility and deflection of all nominal pipe sizes after burial. Restraining gland, wedge segments, and actuating bolts shall be manufactured of high strength ductile iron conforming to the requirements of ASTM A536, Grade 65-45-12. Wedge segments shall be heat treated to a hardness of 370 BHN minimum. Dimensions shall be compatible with standardized mechanical joints conforming to the requirements AWWA C111/ANSI A21.11 and AWWA C153/ANSI 21.53 (latest revision). Breakaway tops shall be incorporated in the design of the actuating bolts to visually ensure proper torque. The actuating bolts must ensure precise and consistent operating torque of the breakaway top. The design of the restraining device shall be such that the gland body evenly bears the stress of the restraining load. The mechanical joint restraining devices shall have a minimum working pressure rating of 350psi for sizes 3 inches to 12 inches and 250 psi for 14 inches and larger and provide no less than a safety factor of 2:1. Restraint shall be UL Listed and FM approved in applicable sizes. The restraints shall be One Lok Series SLCE as manufactured by SIGMA, Series 2000PV as manufactured by EBAA Iron, or Engineer approved equal.

C. All Thread Rod: Where indicated on the drawings or as directed by the Engineer, mechanical joint ends that are required to be restrained by use of all thread rods, shall be 3/4-inch in diameter and constructed of 304 stainless steel. Fastening nuts shall also be constructed of 304 stainless steel. Each joint shall be restrained with a minimum of 3 rods per joint.

2.4 COUPLING AND ADAPTORS

A. Flexible couplings shall be of the sleeve type with a middle ring, two wedge shaped resilient gaskets at each end, two follower rings, and a set of steel trackhead bolts. The middle ring shall be flared at each end to receive the wedge portion of the gaskets. The follower rings shall confine the outer ends of the gaskets, and tightening of the bolts shall cause the follower rings to compress the gaskets against the pipe surface, forming a leak-proof seal. Flexible couplings shall be steel with minimum wall thickness of the middle ring or sleeve installed on pipe being 5/16-inch for pipe smaller than 10 inches, 3/8-inch for pipe 10 inches or larger. The minimum length of the middle ring shall be 5-inches for pipe sizes up to 10 inches and 7 inches for pipe 10 inches to 30 inches. The pipe stop shall be removed. Gaskets shall be suitable for 250 psi pressure rating or at rated working pressure of the connecting pipe. Couplings shall be harnessed and be designed for 250 psi.

B. Flanged adapters shall have one end suitable for bolting to a pipe flange and the other end of flexible coupling similar to that described hereinbefore. All pressure piping with couplings or adapters shall be harnessed with full threaded rods spanning across the couplings or adapters. The adapters shall be furnished with bolts of an approved corrosion resistant steel alloy,

extending to the adjacent pipe flanges. Flanges on flanged adapter (unless otherwise indicated or required) shall be faced and drilled ANSI B16.1 Class 125.

C. Flexible couplings and flanged adapters shall be as manufactured by Dresser, Rockwell, or equal, per the following, unless otherwise specified and/or noted on the Drawings:

D. Steel couplings for joining same size, plain-end, steel, cast iron, and PVC plastic pipe -

Dresser	Rockwell
Style 138	4ll

E. Transition couplings for joining pipe of different outside diameters-

Dresser	Rockwell
Style 162 (4"-12")	413 steel (2"-24")
Style 62 (2"-24")	415 steel (6"-48")
	433 cast (2"-16")
	435 cast (2"-12")

F. Flanged adapters for joining plain-end pipe to flanged pipe, fittings, valves and equipment.

Dresser	Rockwell
Style 127 cast (3"-12")	912 cast (3"-12")
Style 128 steel (3"-48" C.I. Pipe)	913 steel (3" and larger)
Style 128 steel (2"-96" steel pipe)	

2.5 DETECTABLE UNDERGROUND UTILITY WARNING TAPES

A. Detectable underground utility warning tapes which can be located from the surface by a pipe detector shall be installed directly above nonmetallic (PVC, polyethylene, concrete) pipe.

B. The tape shall consist of a minimum thickness of 0.35 mils solid aluminum foil encased in a protective inert plastic jacket that is impervious to all know alkalis, acids, chemical reagents and solvents found in the soil.

C. The minimum overall thickness of the tape shall be 5.5 mils, and the width shall not be less than 2" with a minimum unit weight of 2-1/2 pounds/1" x 1,000'. The tape shall be color-coded and imprinted with the legend as follows:

Type of Utility	Color Code	Legend
Water	Blue	Caution Buried Water Line Below

D. Detectable underground tape shall be "Detect Tape" as manufactured by Allen Systems, or equal.

E. Installation of detectable tapes shall be per manufacturer's recommendations and shall be as close to the grade as is practical for optimum protection and detectibility. Allow a minimum of 18" between the tape and the line.

F. Payment for detectable tapes shall be included in the linear foot price bid of the appropriate bid item(s) unless it is listed as a separate payment item in the bid schedule.

2.6 TRACER WIRE

A. Tracer wire shall be 8-gauge copper wire with 30-mil polyethylene jacket. Tracer wire shall be installed with all buried piping, "duct" taped to top of pipe. Tracer wire shall be secured to the top of the pipe by tape a minimum of 3 times on each standard length of pipe.

B. Split Bolt connectors are required when connecting two (2) pieces of tracer wire. Wire and connector shall be wrapped with electrical tape.

C. Tracer wire shall be brought up into locator boxes with grounding devices. Locator boxes shall be valve boxes with a polystyrene donut that fits around the box to serve as a termination point for tracer wire. Locator boxes shall be installed at a maximum of 500 linear feet apart, or where shown on the Drawings.

D. Payment for tracer wire and boxes shall be included in the linear foot price bid of the appropriate bid item(s) unless it is listed as a separate payment item in the bid schedule

2.7 CONCRETE PIPE ANCHORS, THRUST BLOCKS, CRADLE OR ENCASEMENT

A. Where indicated on the Drawings, required by the Specifications or as directed by the Engineer, concrete pipe anchors, thrust blocks, cradles or encasements shall be installed.

B. Concrete shall comply the provisions in KYTC Standard Specifications Section 601 and be Class B. Reinforcing bars shall be installed as indicated on details.

2.8 PREFABRICATED TRENCH BAFFLES

A. Where indicated on the Drawings, required by the Specifications, or as directed by the Engineer, Contractor shall install pre-fabricated trench baffles in the pipeline trench.

B. The baffle shall be self-supporting, made of ABS (Acryonitrile Butadiene Styrene) or comparable material, and shall provide a watertight seal around the pipe by use of an elastomeric PVC flexible coupling. The purpose of the baffle is to stop the flow of groundwater along the trench, and around the pipe. The trench baffle shall be "Ripley's Dam" as manufactured by EJP, or equal.

2.9 CONNECTION OF NEW WATER MAINS TO EXISTING SYSTEM

A. The Contractor shall connect the new water main to existing water main where shown on the Drawings or directed by the Engineer, and shall furnish all necessary equipment and materials required to complete the connection.

2.10 POLYETHYLENE (PE) TUBING

A. Customer service tubing shall be Polyethylene (PE) and conform to AWWA C901, ASTM F 741 with a pipe designation of PE 3408 defined per STM D 3035 for IPS sizes and ASTM D 2737 for CTS sizes. Customer service tubing size 1-inch, shall be CTS DR-9 (250 psi). Service line tubing size 2-inch, shall be CTS DR-9 (250 psi). Casing tubing size 2-inch and 3-inch, shall be IPS DR-13.5 (160 psi).

2.11 CUSTOMER SERVICE RELOCATIONS AND RE-CONNECTIONS

Where water service lines are disturbed, the Contractor shall reconnect the existing service line to the new water main. The Contractor shall furnish and install the necessary piping, couplings, fittings, etc. necessary to complete the service line re-connection.

A. Service Lines Not Crossing a Road

1. Unless indicated otherwise on the plans, all service lines shall be of PE tubing.
2. Existing water meters shall be relocated and a new water meter setter and new meter box shall be installed unless otherwise indicated by the plans.
3. Water service connections shall be made in accordance with the details shown on the Drawings and/or set forth herein. Locations of the various sizes shall be as directed by the Engineer and as shown on the Drawings.

B. Service Lines Crossing County Road, City Streets, or a State Highway

1. Casing pipe shall be directional drilled under paving where required on plans or by the KY Transportation Cabinet. Casing pipe shall be IPS DR-13.5 PE tubing.
2. Service piping shall be pulled through PE casing pipe. Unless indicated otherwise on the plans. All service lines shall be of PE tubing.
3. Existing water meters shall be relocated and a new water meter setter and meter box shall be installed.
4. Water service connections shall be made in accordance with the details shown on the Drawings and/or set forth herein. Locations of the various sizes shall be as directed by the Engineer as shown on the Drawings.

2.12 CORPORATION STOPS AND FITTINGS FOR HOUSE SERVICE RECONNECTIONS

A. Corporation stops, of the size required, shall be tapped directly into the water main for Ductile Iron Pipe or by the use of a tapping saddle for PVC pipe.

B. Corporation stops shall have AWWA C800-66 C.S. threaded inlet. Outlets shall be suitable for the type of service piping furnished and laid, and the Contractor shall verify compatibility with "iron pipe size" or "copper tubing size" service piping as required before ordering stops.

C. Corporation stops shall be Ford Meter Box Type F1000, F1001, F1002 (as required); Mueller H-15005, H-15006, H-15008, H-15009 (as required); Hayes Series 5200, or equal.

D. Fittings shall be brass.

2.13 SERVICE TAPPING SADDLES

A. Service tapping saddles shall consist of bronze outlet castings for OD controlled PVC pipe. Saddles shall consist of two wide bronze casted straps that are permanently hinged together on one side and bolted on the other side. The outlet shall have a thick tapping boss with enough surface on the exterior to apply a pipe wrench when installing the corporation stop. Castings shall be sealed to pipeline with O-ring seals. Saddle outlets shall be threaded per AWWA C800.

B. Service tapping saddles shall by style S-13000 as manufactured by Mueller Co. style S-70 as manufactured by Ford Meter Box Co., or approved equal.

2.14 COMPRESSION COUPLING FITTINGS FOR SERVICE RECONNECTIONS

A. Compression couplings shall comply with AWWA C800-NL. Outlets shall be suitable for the type of service piping furnished and laid, and the Contractor shall verify compatibility with "iron pipe size" or "copper tubing size" service piping as required before ordering stops.

B. Compression couplings shall be Ford Meter Box Type (as required); Mueller 110 Series, (as required); or approved equal.

2.15 METER BOXES

A. Meter box shall be plastic meter box as manufactured by Ford Meter Box Company, Carlson (Old Castle), or approved equal. Meter box shall have smooth interior and annular extension corrugations and shall be notched at 0 and 180 degrees at the base to accommodate inlet and outlet pipes.

B. Inner diameter of box shall be 18-inches. Minimum depth of box shall be 18 inches.

C. Box shall be high density polyethylene conforming with the minimum requirements of cell classification 424420 B as defined and described in the latest version of ASTM D3350.

2.16 METER BOX COVERS

A. Meter box cover shall be purchased from Oldham County Water District.

2.17 COPPER SETTERS

A. Meter setter shall be a copper setter as shown on the standard detail drawing with 3/4-inch double purpose ends and be 7-inches high. It shall be all purpose, designed for 5/8-inch x 3/4-inch meters, and be of sufficient height to raise meters above the bottom of the meter box. Setter shall be Ford as manufactured by the Ford Meter Box Company, or approved equal, and shall have an inverted key inlet valve and dual check backflow preventer outlet valve. Setters shall be installed so that the meter is centered in the box.

B. Copper shall conform to STM B-575 copper alloy #122.

C. For new customer service meter setting, the water service line shall be extended a minimum of 5 feet beyond the meter box on the customer end. The end of the extension shall be capped or plugged to prevent entry of foreign material until the house connection is made.

PART 3 - EXECUTION

3.1 EXCAVATION FOR PIPELINE TRENCHES

A. Unless otherwise directed by the Engineer, trenches in which pipes are to be laid shall be excavated in open cut to the depths required by field conditions or as specified by the Engineer. In general this shall be interpreted to mean that machine excavation in earth shall not extend below an elevation permitting the pipe to be properly bedded. Installation shall be in accordance with ANSI/AWWA C600 for ductile iron and Cast Iron O.D. (AWWA) PVC pipe or ASTM F-645 for Iron Pipe O.D. (ASTM) PVC pipe except as modified herein.

B. If the foundation is good firm earth and the machine excavation has been accomplished as set out hereinbefore, the remainder of the material shall be excavated by hand, then the earth pared or molded to give full support to the lower quadrant of the barrel of each pipe. Where bell and spigot is involved, bell holes shall be excavated during this latter operation to prevent the bells from being supported on undisturbed earth. If for any reason the machine excavation in earth is carried below an excavation that will permit the type of bedding specified above, then a layer of granular material shall be placed so that the lower quadrant of the pipe will be securely bedded in compact granular fill.

C. Excavation may be undercut to a depth below the required invert elevation that will permit laying the pipe in a bed of granular material to provide continuous support for the bottom quadrant of the pipe. When this method is used, the bedding shall be as set out in Paragraph 3.02 hereinafter.

D. Trenches shall be of sufficient width to provide free working space on each side of the pipe and to permit proper backfilling around the pipe, but unless specifically authorized by the Engineer, trenches shall in no case be excavated or permitted to become wider then 2'-0" plus the nominal diameter of the pipe at the level of or below the top of the pipe. If the trench does become wider than 2'-0" at the level of or below the top of the pipe, special precaution may be necessary, such as providing compacted, granular fill up to top of the pipe or providing pipe with additional crushing strength as determined by the Engineer after taking into account the actual trench loads that may result and the strength of the pipe being used. The Contractor shall bear the cost of such special precautions as are necessary.

E. All excavated materials shall be placed a minimum of two feet (2') back from the edge of the trench.

F. Before laying the pipe, the trench shall be opened far enough ahead to reveal obstructions that may necessitate changing the line or grade of the pipeline.

G. The trench shall be straight and uniform so as to permit laying pipe to lines and grades given by the Engineer. It shall be kept free of water during the laying of the pipe and until the pipeline has been backfilled. Removal of trench water shall be at the Contractor's expense. Dry

conditions shall be maintained in the excavations until the backfill has been placed. During the excavation, the grade shall be maintained so that it will freely drain and prevent surface water from entering the excavation at all times. When directed by Owner, temporary drainage ditches shall be installed to intercept or direct surface water which may affect work. All water shall be pumped or drained from the excavation and disposed of in a suitable manner without damage to adjacent property or to other work.

H. Minimum cover of 30" shall be provided for all pipelines, except those located in the State Highway Right of Way. Those shall have a minimum cover of 42".

3.2 PIPE BEDDING

A. All pipe shall be supported on a bed of manufactured sand, derived from limestone, with gradation results similar to those shown in the table below. Contractor shall submit gradation test results to the Engineer for approval. Manufactured sand shall be washed and contain no fine particles and or dust. In no case shall pipe be supported directly on rock. Bedding shall be provided in earth bottom trenches, as well as rock bottom trenches. Bedding material shall be free from large rock, foreign material, frozen earth, and shall be acceptable to the Engineer. Bedding shall be a minimum of 6" below pipe barrel. Contractor shall be responsible for all dust control associated with the use of Manufactured Sand.

Sieve	% Retained	Cumulated % Retained	% Passing
3/8" (9.5mm)	0	0	100
#4 (4.76mm)	5	5	95
#18 (2.36mm)	43	48	52
#16 (1.18mm)	23	71	29
#30 (0.6mm)	8	79	21
#50 (0.3mm)	4	83	17
#100 (0.15mm)	3	86	14
#200 (75µm)	3.7	89.8	10.2
Pan (0µm)	1.1	100.0	0

B. In all cases the foundation for pipes shall be prepared so that the entire load of the backfill on top of the pipe will be carried on the barrel of the pipe so that none of the load will be carried on the bells.

C. Where flexible pipe is used, the bedding shall be placed up to at least the spring line (horizontal center line) of the pipe. The bedding material and procedures shall conform to ASTM D 2321 and any Technical Specifications set out hereinafter. If conditions warrant, the Engineer may require the bedding to be placed above the springline of the pipe.

D. Where undercutting and granular bedding is involved, it shall be of such depth that the bottom of the bells of the pipe will be at least three inches above the bottom of the trench as excavated. Undercutting is not a separate pay item.

E. In wet, yielding mucky locations where pipe is in danger of sinking below grade or floating out of line or grade, or where backfill materials are of such a fluid nature that such movements of the 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. When ordered by the Engineer, yielding and mucky materials in subgrades shall be removed below ordinary trench depth in order to prepare a proper bed for the pipe. Crushed stone or other such granular material, if necessary, as determined by the Engineer to replace poor subgrade material, shall be a separate pay item and classified as "Special Granular Fill". Removal of poor material is not a separate pay item.

F. Installation shall be in accordance with ASTM D 2321 except as modified hereinafter.

3.3 SPECIAL GRANULAR FILL

A. Special granular fill shall comply with provisions in KYTC Standard Specifications Section 701.

3.4 LAYING PIPE

A. The laying of pipe in finished trenches shall be commenced at the lowest point so the spigot ends point in the direction of flow.

B. All pipes shall be laid with ends abutting and true to line and grade as given by the Engineer. Supporting of pipes shall be as set out hereinbefore under "Pipe Bedding" and in no case shall the supporting of pipes on blocks be permitted.

C. Before each piece of pipe is lowered into the trench, it shall be thoroughly inspected to ensure that it is clean. Each piece of pipe shall be lowered separately unless special permission is given otherwise by the Engineer. 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. 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.

D. Pipe shall not be laid on solid rock. A pad of granular material as specified in Paragraph 3.02 "Pipe Bedding", shall be used as a pipe bedding. Pipe bedding is not a separate pay item. Irregularities in subgrade in an earth trench shall be corrected by use of granular material.

E. When ordered by the Engineer, unsuitable materials in subgrades shall be removed below ordinary trench depth in order to prepare a proper bed for the pipe.

F. When laying of pipe is stopped for any reason, the exposed end of such pipe shall be closed with a plywood or fabricated plug fitted into the pipe bell, so as to exclude earth or other material, and precautions taken to prevent flotation of pipe by runoff into trench.

G. No backfilling (except for securing pipe in place) over pipe will be allowed until the Engineer has had an opportunity to make an inspection of the joints, alignment and grade, in the section laid.

3.5 BACKFILLING PIPELINE TRENCHES

A. Backfilling of pipeline trenches shall be accomplished as shown on the Drawings and with details set forth hereinafter. Before final acceptance, the Contractor will be required to level off all trenches or to bring the trench up to grade. The Contractor shall also remove from roadways, rights-of-way and/or private property all excess earth or other materials resulting from construction. In the event that pavement is not placed immediately following trench backfilling in paved areas, the Contractor shall be responsible for maintaining the trench surface in a level condition at proper pavement grade at all times. Under pavement, all trench backfill shall be in accordance with Method C as shown on the Detail Drawings. All other trench backfill shall be in accordance with Method A or B.

B. Method "A" - Backfilling in Open Terrain:

Backfilling of pipeline trenches in open terrain shall be accomplished in the following manner:

1. The lower portion of the trench, from the pipe bedding to a point 12 inches above the top of the pipe, shall be backfilled with manufactured sand, as specific in paragraph 3.2 A, hereinbefore. This material shall be placed in a manner approved by the Engineer and shall be carefully compacted to avoid displacement of pipe. Compaction shall be accomplished by hand-tapping or by approved mechanical methods.

2. The upper portion of the trench above the compacted portion shall be backfilled with material which is free from large rock. Incorporation of rock having a volume exceeding one-half cubic foot is prohibited. Backfilling this portion of the trench may be accomplished by any means approved by the Engineer. The trench backfill shall be heaped over or leveled as directed by the Engineer.

C. Method "B" - Backfilling Under Sidewalks:

Backfilling of pipeline trenches under sidewalks shall be accomplished in the following manner.

1. The lower portion of the trench, from the pipe bedding to a point 12 inches above the top of the pipe, shall be backfilled with manufactured sand, as specific in paragraph 3.2. A, hereinbefore. This material shall be placed in a manner approved by the Engineer and shall be carefully compacted to avoid displacement of pipe. Compaction shall be accomplished by hand-tapping or by approved mechanical methods.

2. The middle portion of the trench, from a point 12 inches above the top of the pipe to a point 6 inches below the grade line, shall be backfilled with material free from large rock. Incorporation of rock having a volume exceeding one-half cubic foot is prohibited. Backfilling this portion of the trench may be accomplished by any means approved by the Engineer. Water (puddling) may be used as required to obtain maximum compaction.

   Upon approval of the Engineer, the Contractor may backfill the middle portion of the trench with crushed stone, fine gravel, or sand in lieu of materials which require compaction.

3. The upper portion of the trench shall be temporarily backfilled and maintained with crushed stone or gravel until such time as the sidewalk is constructed or the driveway surface is restored.

D. Method "C" - Backfilling Under Streets, Roads, and Paved & Unpaved Driveways:

Backfilling of pipeline trenches under streets, roads and paved & unpaved driveways shall be accomplished in the following manner:

1. The lower portion of the trench, from the pipe bedding to a point 12 inches above the top of the pipe, shall be backfilled with manufactured sand, as specific in paragraph 3.2. A, hereinbefore. This material shall be placed in a manner approved by the Engineer and shall be carefully compacted to avoid displacement of pipe. Compaction shall be accomplished by hand-tapping or by approved mechanical methods.

2. The middle portion of the trench from the point above the initial backfill (12 inches above the pipe) to a point 6 inches below the bottom of the pavement or concrete sub-slab, shall be backfilled with #57 crushed stone.

3. The upper portion of the trench, from a point 6 inches below the bottom of the pavement or concrete sub-slab to grade, shall be backfilled with a base course of dense graded aggregate (DGA as defined in the KYTC Standard Specifications for Roads and Bridges). At such time that pavement replacement is accomplished, the excess base course shall be removed as required.

E. Trenches outside existing sidewalks, driveways, streets, and highways shall be backfilled in accordance with Method "A". Trenches within the limits of sidewalks shall be backfilled in accordance with Method "B". Trenches within the paving limits of existing streets, highways and driveways and unpaved driveways shall be backfilled in accordance with Method "C". All methods are shown on the Detail Drawings. When directed by the Engineer, the Contractor shall wet backfill material to assure maximum compaction.

Before final acceptance, the Contractor will be required to level off all trenches or to bring the trench up to grade. The Contractor shall also remove from roadways, rights-of-ways and/or private property all excess earth or other materials resulting from construction.

In the event that pavement is not placed immediately following trench backfilling in streets and highways, the Contractor shall be responsible for maintaining the trench surface in a level condition at proper pavement grade at all times.

3.6 SETTLEMENT OF TRENCHES

A. Whenever lines are in, or cross, driveways and streets, the Contractor shall be responsible for any trench settlement which occurs within these rights-of-way within one (1) year from the time of final acceptance of the work. If paving shall require replacement because of trench settlement within this time, it shall be replaced by the Contractor at no extra cost to the Owner. Repair of settlement damage shall meet the approval of the Owner.

3.7 CONCRETE THRUST BLOCKS, CRADLE, ANCHORS OR ENCASEMENT

A. Concrete thrust blocks, cradle, anchors or encasement shall be placed where shown on the Drawings, required by the Specifications, or as directed by the Engineer.

B. For cradle and encasement, concrete shall be mixed sufficiently wet to permit it to flow under the pipe to form a continuous bed.

C. For thrust blocks and anchors shall be formed or be sufficiently stiff to maintain the forms indicated on the Details.

D. In tamping concrete, care shall be taken not to disturb the grade or line of the pipe or injure the joints. Concrete placed outside the specified limits or without authorization from the Engineer will not be subject to payment.

E. Water mains shall have concrete thrust or "kicker" blocks at all pipe intersections and changes of direction to resist forces acting on the pipeline. All reducers (increasers) shall be anchored.

3.8 BITUMINOUS CONCRETE HIGHWAY, STREET, AND DRIVEWAY REPLACEMENT

A. The Contractor shall replace those sections of existing roads, streets and driveways required to be removed to install the pipelines under this contract. He shall construct same to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than that which existed prior to the operations.

B. Prior to trenching, the pavement shall be scored or cut to straight edges at least 12 inches outside each edge of the proposed trench to avoid unnecessary damage to the remainder of the paving. Edges of the existing pavement shall be re-cut and trimmed to square, straight edges after the pipeline has been installed and prior to placing the new base and pavement.

C. Backfilling of the trench shall be in accordance with Method "C" as described hereinbefore. Base course for the paving shall be dense graded crushed limestone furnished and placed in accordance with the current requirements of the Standard Specifications for Road and Bridge Construction of the Department of Transportation, to a depth of 6 inches in roads and streets and 4 inches in driveways.

D. A subslab of reinforced concrete shall be placed for state-maintained highways as indicated on the Drawings. The subslab shall have a minimum thickness of 6 inches. Concrete for the subslab shall be 3000 psi, in accordance with the Details shown on the Drawings.

3.9 UNPAVED DRIVEWAY (CRUSHED STONE) SURFACE REPLACEMENT

A. The Contractor shall replace those sections of existing driveways and parking areas required to be removed to install the pipelines under this contract. He shall construct same to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than that which existed prior to the operations.

B. Material for backfilling of the pipeline trench shall be dense-graded aggregate in accordance with Method "C" as described hereinbefore.

3.10 REMOVING AND REPLACING CONCRETE CURB AND GUTTER OR SIDEWALK

A. The Contractor shall remove the curb and gutter or sidewalk when encountered when required for laying the pipe. Only that portion of the curb and gutter or sidewalk needed to lay the pipe shall be removed.

B. Where concrete curb and gutter or sidewalk is removed or disturbed during the construction work, it shall be replaced, using 3000 psi concrete, in fully as good or better condition than that which existed prior to the Contractor's operation.

3.11 REPLACEMENT OF EXISTING MAILBOXES, CULVERTS, CLOTHESLINE POSTS, FENCES AND OTHER SUCH FACILITIES

A. Existing mailboxes, drainage culverts, clothesline posts, fences, and the like shall not be damaged or disturbed unless necessary, in which case, they shall be replaced in as good condition as found as quickly as possible. Existing materials shall be reused in replacing such facilities when materials have not been damaged by the Contractor's operations. Existing facilities damaged by Contractor's operation shall be replaced with new materials of the same type at the Contractor's expense. Work in this category is not a pay item.

B. Replacement of paved drainage ditches within highway right-of-way shall be accomplished in accordance with Department of Transportation specifications.

3.12 PORTLAND CEMENT CONCRETE DRIVEWAY REPLACEMENT

A. Wherever Portland cement concrete driveways are removed, they shall be reconstructed to the original lines and grades and in such manner as to leave all such surfaces in fully as good or better condition than existed prior to the operation.

B. The existing concrete paving shall be sawed or cut to straight edges 12-inches outside the edges of the trench or broken out to an existing joint, as directed by the Engineer. The concrete pavement shall be equal to the existing pavement thickness but not less than 6-inches in thickness for driveways.

C. Pavement shall be reinforced with 6 x 6 #10-10 wire mesh and shall be constructed with 3000 psi concrete.

3.13 RIP-RAP STREAM BANK SLOPE PROTECTION

A. The Contractor shall install rip-rap stream bank slope protection at locations directed by the Engineer. Rip-rap slope protection shall be 12-inches thick and shall meet State D.O.T. Standard Specifications.

3.14 TESTING

A. All pressure piping (lines not laid to grade) shall be given a hydrostatic test of at least 150 psi, but not to exceed the rated working pressure of the pipe or valves. Note: Engineer shall verify

test pressure. Loss of pressure during the test shall not exceed 0 psi in a 4-hour period and 5 psi in a 24-hour period. Any test results that do not meet either of these requirements shall constitute a failure of the pressure test. All pumping equipment and/or plumbing connected to a water system shall be disconnected from the section of piping being tested.

B. No leakage in the pipelines shall be allowed, when tested under the hydrostatic test described above.

C. Contractor shall furnish a recording gauge and water meter for measuring water used during leakage test and recording pressure charts during duration of test. Recording pressure charts shall be turned over to the Engineer at conclusion of tests. The pressure recording device shall be suitable for outside service, with a range from 0-200 psig, 24-hour spring wound clock, designed for 9-inch charts, and shall be approved by the Engineer.

D. Pipelines shall be tested before backfilling at joints except where otherwise required by necessity or convenience.

E. Duration of test shall be not less than four (4) hours where joints are exposed and not less than 24 hours where joints are covered.

F. Where leaks are visible at exposed joints, evident on the surface where joints are covered, and/or identified by isolating a section of pipe, the joints shall be repaired and leakage must be minimized, regardless of total leakage as shown by test.

G. All pipe, fittings, valves, and other materials found to be defective under test shall be removed and replaced at no additional expense to the Owner.

H. Lines which fail to meet tests shall be repaired and retested as necessary until test requirements are complied with.

I. Where nonmetallic joint compounds are used, pipelines should be held under normal operating pressure for at least three days before testing.

J. The Owner will provide initial water for testing the pressure piping. Should the first test fail to pass, all additional water required for subsequent tests shall be furnished at the Contractor's expense.

K. The cost of testing of pressure piping is incidental and is to be included in the Contractor's unit Contract Price.

3.15 CLEAN UP

A. Upon completion of installation of the piping and appurtenances, the Contractor shall remove all debris and surplus construction materials resulting from the Work. The Contractor shall grade the ground along each side of pipe trenches in a uniform and neat manner leaving the construction area in a shape as near as possible to the original ground line.

3.16 DISINFECTION OF POTABLE WATER LINES

A. The new potable waterlines shall not be placed in service – either temporarily or permanently – until they have been thoroughly disinfected in accordance with AWWA Standard C651-05, 2005 and to the satisfaction of the Engineer.

B. After testing, a solution of hypochlorite using HTH or equal shall be introduced into the section of the line being disinfected sufficient to ensure a chlorine dosage of at least 50 ppm in the main. While the solution is being applied, the water should be allowed to escape at the ends of the line until tests indicate that a dosage of at least 50 ppm has been obtained throughout the pipe. Open and close all valves and cocks while chlorinating agent is in the piping system. The chlorinated water shall be allowed to remain in the pipe for 24 hours, after which a residual of at least 25 ppm shall be obtained. The disinfection shall be repeated until 25 ppm is obtained after which time the main shall be thoroughly flushed until the residual chlorine content is not greater than 1.0 ppm, and then may be connected to the system. Also, no additional payment will be allowed for providing taps for chlorine injection and/or flushing, if necessary. The Contractor is responsible for the disposal of highly chlorinated water flushed from the main.

C. The new water line shall not be put into service until bacteriological samples taken at the points specified herein are examined and shown to be negative after disinfection, following the requirements of "Standard Methods for Examination of Water and Wastewater". One set of acceptable samples shall be collected from the new line. Samples are to be taken and tested at every 1200 feet of new water line, at each branch and at each dead end.

D. If trench water has entered the pipe, or excessive quantities of dirt or debris have entered the pipe, samples shall be taken at intervals of approximately 200 feet and the locations identified. Samples shall be taken of water that has stood in the new line for at least 16 hours after flushing is completed.

E. If the initial disinfection does not produce satisfactory bacteriological results, the new line shall be reflushed and resampled. If samples fail, the line shall be rechlorinated by the continuous-feed or slug method until satisfactory results are obtained.

F. All testing documentation shall be submitted to the Owner.

3.17 LAWNS AND GRASSES

A. Provide all labor, materials, and services required for seeding of all disturbed areas caused by construction activities and for installation of sod where indicated on the Contract Drawings or specified herein.

B. Lawns and grasses installation and maintenance shall comply with provisions in KYTC Standard Specifications Section 212.

END OF SECTION 331113

SECTION 331216 – VALVES

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment and services required to furnish and install all valves shown on the Drawings and/or specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification sections, apply to work of this Section.

B. Piping is specified in Division 33 Specification sections.

1.3 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 013323.

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.

C. In accordance with the requirements of the General and Special Conditions and this Section, the following table includes, but is not limited to, the items required to be submitted:

Item Description	Shop Drawings	Product Data	Schedules	Installation Data	Parts Lists	Wiring Diagram	Samples	O & M Manual	Certificates	Warranty	Report	Other
Valves	X	X			X							
Valve Boxes		X										
Access Manhole	X	X										
Yard Hydrant	X	X			X							
Tapping Sleeve, Valve	X	X		X	X							

PART 2 - PRODUCTS

2.1 GATE VALVES

A. Gate valves shall conform with AWWA C-509 standard, and shall be of the resilient seat type, iron body, fully bronze mounted, non-rising stem and have a design working pressure of 250 psi. All assembly bolts shall be stainless steel. Valves shall be of standard manufacturer and of the highest quality both as to materials and workmanship.

B. All gate valves shall be furnished with mechanical joint connections, unless otherwise shown on the Drawings or specified hereinafter.

C. An epoxy coating conforming to AWWA C-550 shall be applied to the interior and exterior ferrous surfaces of the valve except for finished or seating surfaces.

D. All gate valves shall have the name or monogram of the manufacturer, the year the valve casting was made, the size of the valve, and the working water pressure cast on the body of the valve.

E. Gate valves 12 inches and smaller shall be installed in a vertical position. Gate valves greater than 12 inches shall have the bonnet mounted in the horizontal position and have a bevel gear actuator. Gate valves shall be provided with a 2-inch square operating nut and shall be opened by turning to the left (counterclockwise). All valve operating nuts shall be set within a cast iron valve box. There shall be a maximum 48 inches depth of valve operating nut. Contractor must use extension stems, if necessary, to raise operator nut within 48 inches of final grade.

2.2 INSERTION VALVES

A. The Insertion Valve shall consist of three subassemblies: the Valve Body, which shall be mounted pressure tight around the main; the Valve Cartridge, which shall be inserted, under full line pressure, into the Valve Body; and the Cartridge Closure Flange, which shall secure and permanently seal the Valve Cartridge into the Valve Body. Insertion valves shall be available for installation on 4 inches, 6 inches, 8 inches, 10 inches, 12 inches and 16 inches nominal pipe sizes.

B. Valve Body: The valve body shall consist of a two-part 304L stainless steel tapping saddle with a stainless-steel tapping/insertion outlet, welded to the upper half of the saddle. The two-part body shall be assembled around the pipe and pressure-sealed to the main by a single griddled resilient sheet gasket and throat gasket. The gasket shall fully encircle the pipe, providing a 360-degree full-area seal. Suitable fasteners and supporting lugs shall be provided, as specified below.

1. Saddles shall be fabricated of Type 304L stainless steel. The design of the saddles, bolts, lugs and armor plates shall be such that the saddle halves can be mounted, without further modification, pressure-tight around the pipe. Contractor shall excavate and expose the existing pipe to verify the existing pipe type and size prior to ordering the insertion valve.

2. Bolting lugs shall be Type 304L stainless steel weldments and shall be designed and positioned on the saddle halves to ensure accurate assembly of both halves. After

assembly around the pipe, the vertical spacing of the bolting lugs between the two saddle halves shall allow adjustment to accommodate the range of pipe diameters specified above.

3. Bolting studs, nuts, along with any formed metal washers shall be fabricated from Type 304 stainless steel. All screw threads shall be 5/8-11UNC-2 (coarse). Nuts shall be heavy series.

4. Sheet Gasket shall be molded from a virgin SBR elastomer compound that will resist compression set and is compatible with cold drinking water in the normal 32 to 120 degrees. A griddled ("waffle") pattern shall be molded on the inner side of the gasket. Each side (which lies parallel to the run of the pipe) of the Gasket shall be tapered to allow uniform distribution of clamping (gasket) pressure over the entire circumference of the pipe. A stainless-steel Armor Plate shall be attached to each side of the Gasket to bridge the gap between the saddle halves.

5. The tapping/insertion outlet on the upper saddle half shall be fabricated from Type 304 stainless steel and shall have a flange welded to the outlet neck with locking pins to mate with the top groove of the Stuffing Box Plate (which is part of the Valve Cartridge). Below these locking pins, the interior of the outlet shall be accurately bored to seal against the "O"- ring contained in the stuffing box plate. The bore shall be further machined to provide a shoulder to vertically locate the Valve Cartridge when it is inserted into the Body. Two opposing rectangular keyways shall be machined into the interior wall of the outlet to receive the guide keys on the Valve Cartridge carrier.

C. The Valve Cartridge shall consist of a stuffing box plate, valve stem with operating nut, valve plugging head that shall consist of a carrier with an internal deformable sealing element and two external resilient sealing sleeves, and ancillary parts and fasteners. This cartridge shall be inserted into the outlet under full line pressure by means of a Cartridge Inserter.

1. The stuffing box plate shall retain the collar of the valve stem against the cartridge closure flange to prevent vertical motion during normal operation of the Insertion Valve. Suitable thrust washers shall be installed above and below the stem collar.

    a. The bore of this plate shall provide a pressure sealing surface for O-rings mounted on the valve stem.
    b. The exterior of this plate shall be grooved to receive locking pins installed from the nozzle flange after plate has been inserted into the nozzle and has seated against the internal nozzle shoulder. Below this pin groove, the plate shall be further machined to accept an O-ring to provide a pressure-seal between the exterior of the plate and the bore of the nozzle.

2. Valve Stem: The stem shall be machined from 304 stainless steel with a 700 LB torque capacity. During normal operation of the Insertion Valve, rotation of the stem shall advance the valve carrier with sealing devices into the fully closed position to stop flow in the pipe. Reversal of stem rotation shall retract the carrier into the completely open position, allowing full flow through the main.

    a. The Owner shall specify the valve stem to be machined to open the valve by turning it clockwise (open right) or counterclockwise (open left), prior to ordering.

b. The top of the stem shall be provided with a detachable, 2-inch square operating nut.
c. Valve shall be operated at 3 turns per inch for 4 inches through 16 inches.

3. The valve plugging head shall consist of two major components: rigid cylindrical carrier and three elastomer sealing devices, along with connecting parts and fasteners.

a. The carrier shall be a rigid, solid cylinder, turned to provide clearance to enter the access (tapped) hole in the pipe. A vertical central slot shall be machined into the lower portion of the carrier. This slot shall contain a single flat deformable sealing element. The carrier shall consist of a solid CM-909 body with rubber coating on the middle half of the CM-909 body.
b. The bottom of carrier shall be hemispherical to generally conform to the bore of the pipe. It shall be designed to break and to dislodge tuberculation and other deposits that might interfere with a suitable shutdown.
c. The carrier top, above the slot, shall contain an internal stainless-steel thread to mate with that on the valve stem. Suitable mechanical means shall be provided to attach the deformable element to the carrier to ensure retraction upon opening.
d. Rectangular guide keys shall be inserted to the top of the carrier. These keys shall be positioned to engage with and slide in the keyways machined into the interior walls of the outlet. This action shall maintain alignment of the valve cartridge when the Insertion Valve Plus is operated.
e. A single deformable sealing element shall be contained inside the slot in the carrier. The element shape shall be generally flat with the lower end semi-circular to seal the bottom of the pipe. The carrier shall deform that element into sealing contact with the pipe wall when the Insertion Valve is closed.
f. A resilient sleeve shall be attached to each of the two vertical cylindrical sides of the carrier. When the Insertion Valve is closed, these two sleeves shall seal against the deformable element and those surfaces of the pipe not sealed by the element, thereby completing the shutdown.

D. The cartridge closure flange with a flat flange gasket shall be used to complete the installation of the Insertion Valve. After the stuffing box plate has been seated on the shoulder in the outlet and the lock screws have been tightened from the outlet Flange, the Valve Cartridge shall be mechanically secure in the Valve Body. All water leakage paths shall be sealed. A Stem O-ring shall pressure-seal against a bored hole in the closure flange. The flange shall then be bolted to the outlet flange, followed by installation of the valve operating nut.

E. The Insertion shall be Insta-Valve Plus as manufactured by Hydra-Stop, Alsip, Il. The Insta-Valve Plus does not guarantee a 100% shutdown due to unknown factors within the pipe. The Insta-Valve Plus shall be rated to 150 PSI working pressure and 225 PSI test pressure.

2.3 VALVE BOXES - BURIED VALVES (EXCEPT AIR RELEASE AND SEWAGE COMBINATION VALVES)

A. Valve boxes shall be of 5-1/4-inch standard cast iron, two-piece, screw type valve box with drop cover marked "WATER", "SEWER", "DRAIN", as applicable. Valve boxes for gate valves larger than 8 inches shall be three-pieces. Valve boxes shall be accurately centered over valve operating nut and backfill thoroughly tamped about them. Valve boxes shall not rest on the valves but shall be supported on crushed stone fill. They shall be set vertically and properly

cut and/or adjusted so that the tops of boxes will be at grade in any paving, walk or road surface, and in grass plots, fields, woods or other open terrain. Valve boxes and covers shall be manufactured by Tyler Corporation, Opelika Foundry, Bingham & Taylor, or equal.

B. Contractor shall furnish two (2) 6-foot T-handle operating wrenches for underground valves. Nut operator extensions for all valves buried deeper than 3 feet shall be provided with stem extensions sufficient to raise operator nut to within 3 feet of finished grade.

C. Valve boxes shall have extension stems, where necessary when operating nut is raised to be within 4 feet of the existing grade.

D. Wherever valve boxes fall outside of the pavement, the top of the box shall be set in a cast-in-place concrete slab 18" x 18" x 4" thick with the top of the slab and box flush with the top of the ground. This provision shall apply to all new and all existing valve boxes which fall within the limits of the contract, unless otherwise stated on the plans or ordered by the Engineer.

2.4 TAPPING SLEEVES AND VALVES

A. SST tapping sleeves for use in connections to existing water lines, where indicated on the drawings or as directed by the Engineer, shall have the body and neck constructed of ASTM A-240 type 304 stainless steel and shall be compressed to the carrier pipe by use of heavy gauge triangular sidebars running the length of the body. Bolts, nuts and washers shall be constructed of type 304 stainless steel. The gasket between the tapping sleeve and carrier pipe shall be constructed of Buna N rubber and be NSF 61 approved. The gasket shall have a grid pattern to help secure it in place and have seal around the full circumference of the pipe. Tapping outlet connections shall be constructed of ductile iron conforming to ASTM A-536 and have either a mechanical joint connection conforming to AWWA C-111, or a flanged connection with drillings in accordance with ANSI class 125#/150#. Tapping Sleeves shall be suitable for the following working pressures: 4 inches - 12inches 250 psi, 14 inches - 24 inches 200 psi and shall be Mueller No. H-304, Romac Industries SST III, or approved equal.

C. Tapping valves shall meet the requirements of paragraph 2.01 hereinbefore and shall be coordinated to connect to the tapping sleeve with either a flanged end or a mechanical joint end.

D. All existing water mains to be tapped under this contract shall be exposed in order to verify line sizes prior to ordering tapping sleeves and valves.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All valves shall be installed in accordance with details on the Contract Drawings and with the manufacturer's recommendations.

B. All valves shall be anchored in accordance with the details on the Contract Drawings.

END OF SECTION 331216

SECTION 331219 – HYDRANTS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Provide all labor, materials, equipment, and services required for furnishing and installing all hydrants and appurtenances specified herein.

1.2 RELATED WORK SPECIFIED ELSEWHERE

A. Earthwork: Section 312000

B. Valves - Utilities Services: Section 331216

C. Water Distribution Piping: Section 331113

1.3 SUBMITTALS

A. Submit shop drawings and product data in accordance with Section 013323 of this specification.

B. 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.

C. In accordance with the requirements of the General and Special Conditions and this Section, the following table includes, but is not limited to, the items required to be submitted:

Item Description	Shop Drawings	Product Data	Schedules	Installation Data	Parts Lists	Wiring Diagram	Samples	O & M Manual	Certificates	Warranty	Report	Other
Hydrants	X	X		X	X							

PART 2 - PRODUCTS

2.1 FIRE HYDRANTS

A. The Contractor shall furnish and install fire hydrants and auxiliary gate valves where shown on the Drawings or directed by the Engineer. Hydrants shall conform in all respects to the most recent requirements of AWWA C502. Hydrant barrel shall have safety breakage feature above the ground line. All hydrants shall have 6-inch mechanical joint shoe connection and two (2) 4 1/2-inch pumper nozzle with rubber gasketed caps fitted with cap chains. Cap nuts are to be five (5) sided. Connection threads shall be National Standard Thread. Main valve shall have 5-1/4-inch full opening and be of the compression type opening against water pressure so that valve remains closed should barrel be broken off.

B. Hydrants shall be fully bronze mounted. Main valve shall have a threaded bronze seat ring assembly of such design that it is easily removable by unscrewing from a threaded bronze drain ring. Bronze drain ring shall have multiple ports providing positive automatic drainage as the main valve is opened or closed. Drainage waterways shall be completely bronze to prevent rust and corrosion.

C. The operating nut shall be five (5) sided bronze or bronze with a five (5) sided ductile iron cap, and mounted so that a counter clockwise motion will open the valve. There must be cast on top an arrow and the word "Open" indicating the direction of turn to open the hydrant.

D. Operating stem shall be equipped with anti-friction thrust bearing to reduce operating torque and assure easy opening. Stop shall be provided to limit stem travel. Stem threads shall be enclosed in a permanently sealed lubricant reservoir protected from weather and the waterway with O-ring seals.

E. Hydrants shall be shop tested to 300 psi pressure with the main valve both opened and closed. Under the test the valve shall not leak, the automatic drain shall function and there shall be no leakage into the bonnet.

F. Type of shoe connection shall be mechanical joint and size shall be six inches (6").

G. Hydrants shall be given two (2) coats of enamel high visibility (YELLOW) paint to be selected by the Owner.

H. Hydrants shall be Mueller Super Centurion Model A-425 or approved equal.

PART 3 - EXECUTION

3.1 SETTING OF FIRE HYDRANTS

A. Location:

1. Hydrants shall be located as shown or as directed so as to provide complete accessibility and minimize the possibility of damage from vehicles or injury to pedestrians.

2. When placed behind the curb, the hydrant barrel shall be set so that the pumper or hose nozzle cap will be a minimum of five feet (5') from the back of curb.
3. When set in the lawn space between the curb and the sidewalk or between the sidewalk and the property line, no portion of the hydrant or nozzle cap shall be within six inches (6") of the sidewalk.

B. Position:

1. All hydrants shall be set plumb with not less than two (2) cubic feet of crushed stone and shall have their nozzles parallel with the roadway, with the pumper nozzle facing toward the roadway. Hydrants shall be set to the established grade, with nozzles at least eighteen inches (18") above the ground, as shown or as directed by the Engineer.

C. Connection to Main:

1. Each hydrant shall be connected to the main with a six-inch (6") restrained joint ductile iron branch controlled by an independent six -inch (6") gate valve, unless otherwise specified.

D. Hydrant Drainage in Pervious Soil:

1. Whenever a hydrant is set in soil that is pervious, drainage shall be provided at the base of the hydrant by placing uncrushed coarse aggregate (AAHSTO M-43) No. 57 from the bottom of the trench to at least six inches (6") above the drain opening in the hydrant and to a distance of one foot (1') around the elbow. No drainage system shall be connected to a sewer.

E. Hydrant Drainage in Impervious Soil:

1. Whenever a hydrant is set in clay or impervious soil, a drainage pit two feet (2') in diameter and three feet (3') deep shall be excavated below each hydrant and filled compactly with uncrushed coarse aggregate (AASHTO M-43) No. 57 under and around the elbow of the hydrant and to a level of six inches (6") above the drain opening. No drainage pit shall be connected to a sewer (see Standard Details).

3.2 ANCHORAGE

A. The bowl of each hydrant shall be tied to the pipe with suitable anchor couplings, as shown on the Standard Details in the Drawings or as directed by the Owner or Engineer.

3.3 FIRE HYDRANT WRENCHES

A. One (1) hydrant wrench shall be furnished for each ten (10) hydrants or less. When the number of hydrants furnished and installed exceeds twenty-five (25), one (1) hydrant repair kit shall be supplied at no additional cost to the Owner.

END OF SECTION 331219