Andy Beshear
GOVERNOR

TRANSPORTATION CABINET
200 Mero Street
Frankfort, Kentucky 40601

Rebecca Goodman
SECRETARY

May 6, 2026

CALL NO. 102
CONTRACT ID NO. 261119
ADDENDUM # 1

Subject: Christian County, STP 5044002
Letting May 21, 2026

(1) Revised – Completion Date – Cover Page & Page 4 of 105
(2) Added - Special Note – Page 17A of 105
(3) Added - Attachment to Proposal: Utility Notes & Specs – Pages 1-133 of 133

Proposal revisions are available at http://transportation.ky.gov/Construction-Procurement/.

If you have any questions, please contact us at 502-564-3500.

Sincerely,

Rachel Mills, P.E.
Director
Division of Construction Procurement

RM:mr
Enclosures

CALL NO. 102

CONTRACT ID. 261119

CHRISTIAN COUNTY

FED/STATE PROJECT NUMBER STP 5044002

DESCRIPTION LAFAYETTE ROAD(KY 107)

WORK TYPE ASPHALT SURFACE WITH GRADE & DRAIN

PRIMARY COMPLETION DATE 11/25/2026

LETTING DATE: May 21,2026

Sealed Bids will be received electronically through the Bid Express bidding service until 10:00 AM EASTERN DAYLIGHT TIME May 21,2026. Bids will be publicly announced at 10:00 AM EASTERN DAYLIGHT TIME.

PLANS AVAILABLE FOR THIS PROJECT.

DBE CERTIFICATION REQUIRED - 0%

REQUIRED BID PROPOSAL GUARANTY: Not less than 5% of the total bid.

ADMINISTRATIVE DISTRICT - 02

CONTRACT ID - 261119

STP 5044002

COUNTY - CHRISTIAN

PCN - DE02401072619
STP 5044002

LAFAYETTE ROAD(KY 107) IMPROVE SAFETY AND MOBILITY BY WIDENING AND CORRECTING GEOMETRIC DEFICIENCIES ON KY 107 FROM MILEPOINT 15.0 TO MILEPOINT 15.6, A DISTANCE OF 0.60 MILES.ASPHALT SURFACE WITH GRADE & DRAIN SYP NO. 02-80250.10.

GEOGRAPHIC COORDINATES LATITUDE 38:48:36.00 LONGITUDE 87:30:36.00

ADT

COMPLETION DATE(S):

COMPLETED BY 08/31/2026	INTERMEDIATE - SEE SPECIAL NOTE
COMPLETED BY 11/25/2026	APPLIES TO ENTIRE CONTRACT

SPECIAL NOTES FOR FIXED COMPLETION DATE AND LIQUIDATED DAMAGES

Ky 107/Lovers Lane Sight Distance Improvement

Christian County

Item No. 02-80250.10

INTERMEDIATE COMPLETION DATE

All utility work within the contract shall be completed by August 31, 2026.

FIXED PROJECT COMPLETION DATE

Project completion date is November 25, 2026.

INTERMEDIATE COMPLETION DATE

Liquidated Damages in the amount specified in the Standard Specifications, per calendar day, will be assessed for each day the utility work remains incomplete beyond the Intermediate Completion Date listed above.

Liquidated Damages in the amount specified in the Standard Specifications, per calendar day, will be assessed for each day work remains incomplete beyond the Specified Project Completion Date. This project has a Fixed Completion Date of November 25, 2026.

Also contrary to Section 108, liquidated damages will be charged during the months of December through March.

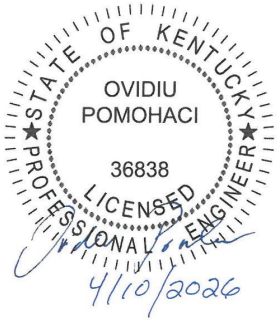
GRW Engineers, Inc.

Engineering
Architecture
Planning
GIS
Aviation Consultants

Indianapolis, IN
Lexington, KY
Louisville, KY
Knoxville, TN
Nashville, TN
Saint Albans, WV
Buckhannon, WV

Contract Documents and Technical Specifications

engineering | architecture | geospatial



Hopkinsville Water Environment Authority

KY 107 (Lafayette Road) 12” Water Main Relocation

Hopkinsville, KY

HWEA Contract No. 142-2026-01
KYTC Item No. 02-80250.00
GRW Project No. 5325-01

April 2026

Regulatory Review Set

TABLE OF CONTENTS

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 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.

1.14 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.

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. The Engineer shall review all Shop Drawings prior to submission to HWEA. Following Engineer review, all Shop Drawings shall be submitted to HWEA for formal review and digital stamp. Shop Drawings shall not be returned to the Contractor without HWEA review, except for submittals classified by the Engineer as “Revise and Resubmit,” “Rejected,” or “Furnish 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. Project Closeout: Section 017700.

B. 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.

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 shall either be restrained joint with push-on gaskets or push-on joints with restrained glands.

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. The casing pipe shall be new and bituminous coated.

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	24	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")	.500 (1/2")	.500 (1/2")	.500 (1/2")	.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 seven (7) 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

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". Water service lines (customer service tubing) installed via HDD shall conform to Section 331113, Paragraph 2.10.

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. HDPE pipe shall be PE 4710 high density polyethylene conforming to AWWA C906. Minimum pressure class shall be DR11 (200 psi).
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 - PE 4710
    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 No. 14 AWG solid copper with minimum 30 mil high-density polyethylene (HDPE) insulation, suitable for direct burial. 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.

C. The contractor shall install concrete thrust blocks at each bend in the pipeline of five (5) degrees or greater to withstand a test pressure of 200psi

D. All fittings shall be double polywrapped. Care shall be taken to avoid damaging the polywrap.

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 high-density polyethylene (HDPE) pipe with PE 4710 resin conforming to ASTM D3350. Service tubing shall conform to AWWA C901 and ASTM D2737 for CTS sizes and ASTM D3035 for IPS sizes.

1. 3/4-inch service tubing shall be BLUE CTS SDR-9 (250 psi).
2. 1-inch service tubing shall be BLUE CTS SDR-9 (250 psi).
3. 2-inch service tubing shall be BLUE CTS SDR-9 (250 psi).

Casing tubing sizes 2-inch and 3-inch shall be IPS DR-13.5 (160 psi) conforming to AWWA C906.

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 all piping, couplings, fittings, meter boxes, and appurtenances necessary to complete the service line reconnection, except for the water meter, which shall be furnished and installed by HWEA.

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 removed, protected, and made available for reuse or disposition as directed by HWEA. HWEA will furnish and install the water meter. The Contractor shall furnish and install a new meter setter and meter box at the location shown on the Drawings or as directed by the Engineer.
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 removed, protected, and made available for reuse or disposition as directed by HWEA. HWEA will furnish and install the water meter. The Contractor shall furnish and install a new meter setter and meter box.
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.

C. Direct taps to the new water main for service connections one (1) inch and smaller shall be permitted, provided such taps are performed in accordance with the pipe manufacturer’s recommendations and applicable HWEA standards.

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 shall be SIGMA RMP 182224-FB-W Raven Meter Pit, or approved equal.

2.16 METER BOX COVERS

A. Meter box cover shall be Ford FA32 Style Cast Iron Frame with FORD WA3LPR-BR Style Plastic Lid.

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.

2.18 WATER LINE MARKERS

A. Water line markers shall be Carsonite CLM or 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 36" 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 AND BACKFILLING PIPELINE TRENCHES

A. Pipe bedding and initial backfill shall be constructed in accordance with the Drawings and applicable HWEA Standard Details. Bedding shall consist of select earthen backfill when installed in soil conditions, and manufactured sand when installed in solid rock, as indicated in Detail W-2, Table A-1.

B. Bedding shall provide uniform and continuous support along the full length of the pipe and shall be placed to a minimum thickness of four (4) inches below the pipe, or five (5) inches where installed in solid rock. Bedding material shall be placed and compacted to provide firm, stable support without voids.

C. Initial backfill shall be placed from the top of bedding to a minimum height of six (6) inches above the top of pipe and shall consist of the same material as the bedding. Material shall be carefully placed and compacted to avoid displacement or damage to the pipe.

D. In paved areas, trench backfill above the initial backfill shall consist of KYTC No. 8 stone and KYTC Dense Graded Aggregate (DGA) compacted to a minimum of 95 percent of maximum dry density. In unpaved areas, trench backfill shall consist of select earthen material placed and compacted in accordance with the Drawings and Detail W-2.

E. Bedding and backfill operations shall be performed in a manner that prevents lateral displacement of the pipe and maintains proper alignment and grade.

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 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.

3.6 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.

3.7 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.

3.8 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.

3.9 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.

3.10 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 200 psi, but not to exceed the rated working pressure of the pipe or valves. Water mains shall be

hydrostatically tested according to AWWA C600, latest revision. the test shall be conducted at 200-psi for 24-hours with a leakage allowance of 12 gal. / in. diameter / mile, or 4-hours if no leakage is measured. The contractor shall submit a testing plan for review by the engineer and HWEA.

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.

3.14 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 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. Bacteriological Testing - After flushing, the Owner will collect bacteriological samples from the pipeline in accordance with AWWA C651. Testing requirements include:

1. Establishment of a core zone up to the first ½ mile of new pipeline, with two samples collected from the core zone.
2. One sample per mile of new distribution main thereafter.
3. Additional samples collected at the end of the line, each branch line, and at connections to existing mains.
4. Water samples shall be delivered to a certified laboratory within six hours of collection for bacteriological analysis.

D. 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.

E. 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.

F 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.

G. All testing documentation shall be submitted to the Owner.

3.16 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.

3.17 POLYETHYLENE ENCASEMENT (POLY WRAP)

A. Material - Polyethylene encasement shall conform to AWWA C105. Polyethylene encasement shall consist of:

1. Linear low-density polyethylene (LLDPE) or high-density polyethylene (HDPE) film.
2. Minimum thickness of 8 mil for flat sheet or tube.
3. Polyethylene shall be continuous and free of tears or punctures.

B. Installation

Polyethylene encasement shall be provided for all buried ductile iron pipe, fittings, and valves unless otherwise indicated on the Drawings. Polyethylene encasement shall be installed in accordance with AWWA C105 and the pipe manufacturer’s recommendations. Installation requirements shall include:

1. Wrap pipe, fittings, and valves with polyethylene prior to placement in the trench.
2. Secure the polyethylene film with tape or plastic ties at sufficient intervals to hold the wrap in place.
3. Overlap seams a minimum of 12 inches and tape securely.
4. Repair any punctures or tears with polyethylene tape or replace the damaged section of wrap.
5. Ensure polyethylene encasement is loosely fitted to allow for expansion and movement of the pipe.

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 24 inches depth of valve operating nut. Contractor must use extension stems, if necessary, to raise operator nut between 12 to 24 inches of final grade.

F. Gate Valves shall be Mueller 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 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, slide-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. Valve boxes shall have extension stems, where necessary when operating nut is raised to be between 12-24 inches of the existing grade.

C. Wherever valve boxes fall outside of the pavement, the top of the box shall be set in a cast-in-place concrete slab 24" x 24" x 6" 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 250 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