

City of Goshen, Indiana
Design Standards and Specifications Details
For
Kercher Road Reconstruction

General Specifications

1. Compaction Requirement

Compaction of soils around and over all installed pipes and of the subgrade under the pavement by a vibratory roller shall follow the City of Goshen guidelines for the installation of pipe beneath a paved road. All compaction of the sub-grade under pavement and sidewalks, shall be incidental to the contract and not paid for separately, but included in the various bid items

The minimum modified proctor soil compaction requirements for backfill material and pavement subgrade will be as follows:

Subgrade under any roads, pavements, curbs, and drainage structures.....	100%
Subgrade under sidewalks.....	98%
Topsoil used in all but the top six inches (4") of fills in areas specified.....	90%
Existing ground receiving fills.....	90%
Backfill in pipe and conduit trenches under any roads, pavements and curbs	98%
Backfill in pipe and conduit trenches not under pavement or curbs.....	95%
All other areas receiving fill.....	90%
Compacted Aggregate Base.....	100%

Compaction tests, based upon the modified proctor, shall be run for 2-foot lifts at intervals not to exceed 500 feet. Cost associated with required testing shall be incidental to the pipe material bid items.

Maximum density shall be determined by AASHTO T 99 as modified by Section 203.24 of the State Specifications using Method "A" for soil and Method "C" for granular material.

The Contractor shall keep all public roadways that are used for hauling excavation or borrow material clean and free of any spillage of material. Said public roadways shall be cleaned on a daily basis. The cost of removal of any spillage shall be included in the unit cost of excavation or borrow material and no further compensation will be made.

All excavations and trenches shall be properly braced to furnish safe working conditions in accordance with Federal, State and Local laws, statutes and ordinances. The Engineer may order the Contractor to provide additional bracing should there be danger of injury or potential damage to existing or adjacent structures. Close sheeting, well points, or both, shall be used whenever running sand is encountered.

2. Record Drawings

Record Drawing Information

The Contractor, at no extra cost, shall furnish the City a complete set of record drawings with all deviations, changes, errors, omissions, underground utilities, including structure invert and rim elevations,

pipe slopes, hydrants, valves and fittings, tap locations, pipe size, type, elevations, and lengths, roadway centerline and gutter elevations plainly marked, and certification that their drawings are true and accurate. The record drawings need to be prepared and certified by a licensed surveyor and shall be provided in hard copy and electronic format compatible with AutoCAD 2008 not to exceed AutoCAD Civil 3D 2014. The record drawings shall include the following, but not be limited to:

The following applies to new or modified infrastructure within construction corridor.

Sewer Installation

1. Field measured location and inverts of manholes.
2. Field measured location and inverts of catch basins, inlets, and storm water treatment units.
3. Size, length, material type and constructed slopes of installed pipe.
4. Field measured location and depth of sanitary service laterals. Locations for laterals shall be measured linearly from the downstream manhole.
5. Identify and map buried utilities that cross the installed utility (i.e., water, gas, telephone, electric, etc.)
6. Sewer lateral record drawing details. (CAD block sent via email upon request) See Sanitary Sewer Lateral Record Detail.

Water Main Installation

1. Field measured location and depth of constructed water main.
2. Field measured location and depth of constructed water services.
3. Field measured location of water valves. Valves shall be dimensioned off of the adjacent street centerline and the nearest cross street centerline, and the nearest property iron.
4. Field measured location of any fire hydrants.
5. Field measured location of any "Tee" or "Cross" or "Angle" fitting.
6. Field measured location of any reducers.
7. Identify and map buried utilities that cross the installed utility. (i.e., sewer, water, gas, telephone, electric, etc.)
8. Water services record drawing details. (CAD block via email upon request) See Water Service Record Detail.

Conduit Record Drawings

1. Installed pipe length between access structures.
2. Horizontal and vertical alignment of the communication conduit every 25-feet as measured to the roadway centerline and the surface grade over the pipe.
3. Location of handholes measure from the centerline of two perpendicular roadways (e.g. an alley would be considered a roadway).
4. Identify and map buried utilities that cross the installed utility (i.e. sewer, water, gas, telephone, electric, etc.).
5. Field measured location of fiber markers.
6. Size, length, material type and color of installed pipe.

Existing Water, Sewer, Fiber Conduit, Structures, and Lines

1. Show if the existing utility lines were
 - Abandon in-place, brick & mortar ends, or
 - Abandon in-place, filled with flowable mortar, or
 - Removed below grade, filled with flowable mortar, or
 - Removed completely
2. Show if structures were:

- Removed below grade, filled with (name material), or
 - Removed completely
3. Show if valves were
 - Valve turned off, box removed
 - Removed completely
 4. Field measured location of capped lines.

Roadway

1. Centerline monumentation.
2. Right-of-way monumentation.

General

1. Contractor's name, address, Contractor's superintendent, year constructed, and project inspectors name. (CAD block via email upon request) See Contractor Detail.
2. The Contractor shall certify the accuracy of all record drawings.

The Contractor shall certify the accuracy of all record drawings.

USE THIS DETAIL ONLY IF SANITARY SEWER IS NOT IN SERVICE AREA

WATER SERVICE RECORD DETAIL

① = DOWNSTREAM MANHOLE NUMBER
② = LOCATION OF CORPORATION STOP FROM DOWNSTREAM MANHOLE (FEET)
③ = LOCATION OF CURB STOP FROM DOWNSTREAM MANHOLE OVER THE MAIN (FEET) (IF NOT PERPENDICULAR)
④ = LENGTH OF SERVICE OFF MAIN IN A STRAIGHT LINE (FEET)
⑤ = DEPTH OF SERVICE AT PROPERTY LINE (FEET)

NOTE TO DRAFTER: DIMENSIONS ARE TO AID IN UNDERSTANDING THE DETAIL. PLEASE DO NOT PUT THE DIMENSION ON THE DRAWING USE ① ② ③ ④. **DO NOT PUT THIS NOTE ON THE DRAWING.** [XXXXXXXXXX] PLEASE TRY TO PUT THIS DETAIL ON EACH PLAN SHEET.

WATER SERVICE RECORD DETAIL

① = NEAREST FIRE HYDRANT
② = LOCATION OF CORPORATION STOP FROM NEAREST FIRE HYDRANT (FEET)
③ = LOCATION OF CURB STOP FROM NEAREST FIRE HYDRANT OVER THE MAIN (FEET) (IF NOT PERPENDICULAR)
④ = LENGTH OF SERVICE OFF MAIN IN A STRAIGHT LINE (FEET)
⑤ = DEPTH OF SERVICE AT PROPERTY LINE (FEET)

NOTE TO DRAFTER: DIMENSIONS ARE TO AID IN UNDERSTANDING THE DETAIL. PLEASE DO NOT PUT THE DIMENSION ON THE DRAWING USE ① ② ③ ④. **DO NOT PUT THIS NOTE ON THE DRAWING.** [XXXXXXXXXX] PLEASE TRY TO PUT THIS DETAIL ON EACH PLAN SHEET.

SANITARY SEWER LATERAL RECORD DETAIL

① = DOWNSTREAM MANHOLE NUMBER
② = LOCATION OF TEE FROM DOWNSTREAM MANHOLE (FEET)
③ = LOCATION OF CLEAN OUT FROM DOWNSTREAM MANHOLE OVER THE MAIN (FEET) (IF NOT PERPENDICULAR)
④ = LENGTH OF LATERAL OFF MAIN IN A STRAIGHT LINE (FEET)
⑤ = DEPTH OF LATERAL AT PROPERTY LINE (FEET)

NOTE TO DRAFTER: DIMENSIONS ARE TO AID IN UNDERSTANDING THE DETAIL. PLEASE DO NOT PUT THE DIMENSION ON THE DRAWING USE ① ② ③ ④. **DO NOT PUT THIS NOTE ON THE DRAWING.** [XXXXXXXXXX] PLEASE TRY TO PUT THIS DETAIL ON EACH PLAN SHEET.

CONTRACTOR:

CONTRACTOR'S NAME
STREET ADDRESS
P.O. BOX NUMBER
CITY, STATE ZIP CODE
PHONE NUMBER

CONTRACTOR SUPERINTENDENT: SUPERINTENDENT NAME
YEAR CONSTRUCTED: MONTH YEAR
PROJECT INSPECTOR: INSPECTOR'S NAME

RECORD DRAWING

THIS RECORD DRAWING IS NOT WARRANTED, BUT IS BELIEVED TO REPRESENT CONDITIONS UPON COMPLETION OF CONSTRUCTION, WITHIN REASONABLE TOLERANCES, BASED UPON INFORMATION FURNISHED TO THE ENGINEER PERTAINING TO CHANGES MADE DURING CONSTRUCTION.

Materials

1. Polyvinyl Chloride (PVC) Pipe

General Description

The bid price shall include, but will not be limited to, all cost for labor, materials, tools, equipment, backfill material, backfilling, excavation and compaction.

Pipe Material

The pipe shall conform to ASTM Designation D3034 with a minimum SDR rating of 35 for 4" to 15" diameter sewer and ASTM F-679 for sizes 18" and larger, or ASTM Designation D2241, with a SDR rating of 26, each with bell and spigot joints. All PVC sewer joints shall be water tight and meet the requirements of ASTM Designation D3212. Installation of the pipe shall conform to ASTM Designation D2321.

The pipe and fittings shall be homogeneous throughout and free from visible cracks, holes, foreign inclusions, or other injurious defects. The pipes shall be as uniform as commercially practical in color, opacity, density, and other physical properties.

Pipe Fittings

PVC fittings shall meet the requirements of ASTM Designation D3034. The connections shall be manufactured to accept 6 inch PVC pipe as specified in these specifications. The location of these "TEE" connectors will be determined by the Engineer in the field.

Contractor shall supply and install all necessary 6"-45 deg. Bends, plugs, and other fittings which may be required for the installation of the sewer main. All such fittings, unless listed the itemized offer, shall be considered incidental to the respective sewer items and will not be measured for payment.

Reconnecting Existing Service Laterals

Contractor shall provide all items necessary to completely reconnect the existing service laterals to the new sanitary sewer line. This will be done in areas where the existing sanitary sewer is being replaced. It is not known what type of material is currently being utilized for the existing service lateral material. Contractor is advised that field verification of size and depth and location of all service laterals will be necessary and should be considered incidental to this pay item.

The structure connections shall be laid with a minimum rise of 1/8 inch per foot between the sewer and the property line.

Contractor shall use a strong-back pipe coupling when connecting dissimilar pipe materials.

Contractor shall install a **double sweeping** cleanout at the right-of-way for each existing and proposed sewer lateral identified for reconstruction as part of the designated work.

Recording Location of Building Sewers, Etc.

Contractor shall keep a record of the location of all building connections, Y-branches, and other openings in the sewer. The location will be made by measurements to the center of the nearest downstream manhole. All such locations shall be compiled in a neat readable manner and delivered to the Engineer.

Backfilling

The Contractor shall not backfill sewers above the top of the pipe until the sewer elevations, gradient, alignment and the pipe joints have been installed correctly. The Engineer or his/her duly authorized agent shall retain the capacity to check, inspect, and approve all sewer elevations, gradient, alignment, and pipe joints at any time during construction.

All sewer pipe as soon as laid shall have the space between the pipe and the bottom and sides of the trench packed full by hand and thoroughly tamped and compacted with a shovel or light tamper, as fast as placed, in lifts not to exceed four (4) inches up to a depth of at least eight (8) inches above the top of the pipe. The filling shall be carried up evenly on both sides. Care shall be taken that no rock, frozen material, or other hard substances are placed in contact with the pipe.

Material for backfilling the space between the pipe and the bottom and sides of the trench and for covering to a depth of two (2) feet, shall be No. 8 thru No. 11 crushed stone, free from stones larger than two (2) inches, frozen material or other hard substances (except for conditions hereinafter defined). Stone backfill shall be incidental to the pipe material bid item.

The remainder of the trench shall be backfilled by using the material originally excavated (except for conditions hereinafter defined), to a height slightly above the original elevation of the ground. Backfilling shall not be left unfinished for more than 100 feet behind the completed pipe work.

No heavy rock shall be dropped into the trench nor placed within three (3) feet of the sewer pipe. In depositing rock in the trench care must be taken that the rock does not injure the structure. All spaces between pieces of rock shall be filled with earth to insure there being no voids.

Backfilling from eight (8) inches above the top of the pipe to final grade shall be made in lifts not exceeding two (2) feet in depth, and shall meet the compaction requirements of 98% modified proctor density when beneath pavement and 95% in all other locations.

All backfill material shall be "B" borrow or better or shall be approved by the Engineer.

Sewer Proximity to Other Utilities

Where the sewer is shown or noted on the plans to be constructed parallel to and close to any existing water main, sewer, gas line, or fiber optic line, the exact location of which is not shown, the Engineer may shift the location of the new sewer where possible to avoid interference. No additional compensation will be allowed for the shifting of the sanitary sewer to avoid such interference. In general, the Contractor shall determine the exact location of existing utilities before starting construction as part of the work under these items.

Testing

Infiltration - Exfiltration

It shall be the intention of these specifications to secure a sewer system including manholes with a minimum amount of infiltration and exfiltration. The maximum allowable infiltration and exfiltration shall be 200 gallons per inch pipe diameter per mile per day, per inch of diameter of sewer, per 24 hour day, at any time during the day. The joints shall be tight and visible leakage in the joints in excess of that specified above shall be repaired by the Contractor, at the Contractor's own expense, by any means found necessary. It shall be the Contractor's responsibility to conduct the necessary tests, or to make arrangements (at no additional cost to the owner) for the tests to be made by other qualified parties, to determine if the newly constructed sewer system meets the requirements mentioned above. The infiltration and exfiltration tests shall be made in the presence of the Engineer or his duly authorized agents. (The results of the infiltration and exfiltration test on the newly completed sewer must be submitted to the Indiana Department of Environmental Management, within three (3) months of completion of the sewer construction.)

In accordance with the above specifications, the maximum allowable quantity shall be as set forth in the following tabulations:

<u>Pipe Diameter</u>	<u>Gallons per Day per Linear Foot</u>
6" X 0.0378787 =	0.2273
8"	0.3030
10"	0.3788
12"	0.4545
15"	0.5682
18"	0.8522
30"	1.1363

Low-Pressure Air Test

This test shall be performed according to ASTM F 1417 "Test Method for Installation Acceptance of Plastic Gravity Lines Using Low-Pressure Air." This practice for testing shall be performed on lines after connection laterals, if any, have been plugged and braced adequately to withstand the test pressure, and after the trenches have been backfilled for a sufficient time to generate a significant portion of the ultimate trench load on the pipe line. The time between the completion of the backfill operation and air testing shall be determined by the Engineer or the Engineer's duly authorized agent.

Plug all openings in the test section. Add air until the internal pressure of the line is raised to approximately 4.0 psi. After this pressure is reached, allow the pressure to stabilize. The pressure will normally drop as the air temperature stabilizes. This usually takes 2 to 5 minutes, depending on the pipe size. The pressure may be reduced to 3.5 psi before starting the test. Start the test when the pressure has stabilized. If the pressure drops more than 1.0 psi during the test time, the line is presumed to have failed the test. If a 1.0 psi drop does not occur within the test time, as shown in the following table, or as calculated and defined in ASTM F1417 for other lengths, the line has passed the air test.

Pipe Diameter, in.	Specification Time for Length (L) Shown, min:s							
	100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
8	7:34	7:34	7:34	7:34	7:36	8:52	10:08	11:24
10	9:26	9:26	9:26	9:53	11:52	13:51	15:49	17:48
12	11:20	11:20	11:24	14:15	17:05	19:56	22:47	25:38
15	14:10	14:10	17:48	22:15	26:42	31:09	35:36	40:04
18	17:00	19:13	25:38	32:03	38:27	44:52	51:16	57:41
21	19:50	26:10	34:54	43:37	52:21	61:00	69:48	78:31
24	22:47	34:11	45:34	56:58	68:22	79:46	91:10	102:33
30	35:37	53:25	71:13	89:02	106:50	124:38	142:26	160:15

Groundwater above the pipe will reduce air loss. If the section of pipe under test shows significant infiltration, the Engineer or the Engineer's duly authorized agent may require an infiltration test.

Deflection Testing

Deflection measurements shall be made on mainline pipe upon completion of the project providing the pipe has been installed for not less than 30 days and not more than 12 months prior to testing.

Note: The period of 30 days to 12 months is deemed an adequate time period for the soil to settle and stabilize. This phenomenon is dependent on geographical climatic conditions such as: Heavy rains or snows, changing water tables, extended dry period or freeze-thaw cycles. The Engineer shall designate when the testing will be performed.

Instructions for mandrel deflection testing are as follows:

1. Completely flush the line making sure the pipe is clean of any mud or trash that would hinder the passage of the mandrel.
2. During the final flushing of the line, attach a floating block or ball to the end of the mandrel pull rope and float the rope through the line. (A nylon ski rope is recommended).
3. After the rope is threaded through the line, connect the pull rope to the mandrel and place the mandrel in the entrance of the pipe.
4. Connect a second rope to the back of the mandrel. This will enable you to retrieve the mandrel if excess deflection is encountered.
5. Remove all the slack in the pull rope by gently pulling the rope at the far manhole. After the slack has been removed, place a tape marker on the rope close to the pipe where the mandrel will exit. If mandrel encounters excessive deflection, the marker will provide a means of measuring the travel distance of the mandrel so that the deflected area can be located.
6. Draw mandrel through the sewer line.

7. An increasing resistance to pull is an indication of excessive deflection. If this occurs, measure beginning marker on rope to the manhole. Locate section and replace bedding or pipe if visual examination reveals damage.

8. Retest.

2. Connection into Existing Manhole or Structure

General Description

For the unit price bid, the Contractor shall furnish all materials, tools, work, earth excavation, sheeting, shoring, coring, debris removal, pipe placement, backfilling, compaction, grading and all other operations necessary to tap into an existing manhole structure.

Connection Material

All taps into existing manhole structures shall be cored when the pipe diameter is 30-inches or smaller. High performance flexible connectors meeting ASTM C923, "Standard Specification for Resilient Connectors between Reinforced Concrete Manhole Structures, Pipes, and Laterals", shall be installed for pipe sizes of 30-inches or smaller. Under no circumstances shall saw cutting or bursting of the manhole wall be permitted.

Pipes entering an existing structure shall not protrude into the structure and shall be set flush with the interior of the structure wall. Connectors shall be installed according to manufacturer's instructions.

Elevations

Contractor shall field verify all applicable elevations prior to performing coring. Applicable elevations include, but may not be limited to: rim, manhole invert, and other pipe inverts entering the structure.

Measurement and Payment

The Contractor shall be paid on a unit price basis for each complete connection to an existing manhole of the various sizes specified. The specified sizes correspond to the pipe diameter to be connected to the structure.

3. Sewer Manholes

General Description

For the unit price bid, the Contractor shall furnish all materials and do all work necessary to construct in place the manholes, drop connections, and appurtenances, complete and ready for operation, as shown on the plans, as specified, or as ordered by the engineer.

Work included under these items shall be all earth excavation, backfill, sheeting, shoring, disposal of excess material, cleanup and all concrete, reinforcing steel, masonry work, ductile iron steps, cast iron frames and covers, pipe and fittings, and all other work and materials necessary to complete the manholes and appurtenances as shown on the plans, as specified, and as ordered by the Engineer, except such work as is specified included under other contract items.

Manhole Requirements

Manholes shall be 4 foot in diameter and shall be constructed of precast concrete in accordance with the ASTM Specifications for "Precast Reinforced Concrete Manhole Risers and Tops", designation C-478. The minimum wall thickness shall be 5 inches. Unless otherwise specified or shown on the plans, manhole tops shall be of the eccentric cone type. Precast flat covers and flat bottoms shall be a minimum of 8 inches thick reinforced with two layers of steel with a minimum area of 0.39 square inches per linear foot in both directions in each layer. Each section joint shall contain a rubber O-ring gasket or mastic type sealer as approved by the Engineer. Each section shall contain standard manhole steps constructed of ductile iron. Drawings of the manholes must be submitted to the Engineer for the approval prior to construction.

Flat Slab Top

A flat top slab design shall utilize the appropriate sections of ACI 318. The slab shall have a minimum thickness of 6-inches for risers up to and including 48-inches in diameter and 8-inches for larger diameters. The flat slab access opening shall be a minimum of 24-inches in diameter, and shall be additionally reinforced with a minimum of the equivalent of 0.20-in² of steel at 90-degrees. The flat top joint with the manhole base, riser or top section shall be formed with a male and female end.

Rubber Pipe Gaskets

All manholes used on this project shall have flexible rubber gaskets cast in place for each sewer invert. The gaskets shall be installed so that the sewer pipe can be inserted through the gasket and the gasket sealed to the sewer pipe through the use of a compression wedge or ring. The end result shall produce a watertight, flexible connection between the sewer pipe and the manhole wall.

Manhole Steps

Manhole steps shall be ductile iron or plastic coated steel meeting the loading requirements of ductile iron. Steps shall be installed in vertical alignment.

Frames and Covers

Manhole covers shall be Neenah R1772A or 1772B with Type B lid or approved equal.

All manhole frames and covers shall be of gray iron free from any blowholes, etc., and shall conform to ASTM Designation A-48.

Frames and covers shall be rated for H20 and H20S loading conditions (16,000 lbs.) as designated in AASHTO "Standard Specifications for Highway Bridges".

Where manhole covers are located in ditch lines or points where excessive infiltration may occur, said covers shall be made watertight.

Separation of collection systems from water mains

- (a) Sanitary sewers shall not be located within ten (10) feet of any existing or proposed water mains, when measured horizontally from the outside edge of the sanitary sewer to the outside edge of any existing and proposed water mains, unless the sanitary sewers and the water main comply with the following:

- (1) The sanitary sewer and water main must cross with the sanitary sewer and water main separated by a minimum of eighteen (18) inches measured vertically from the outside edge of the sanitary sewer to the outside edge of the water main.
 - (2) The crossing specified in subdivision (1) must be at a minimum angle of forty-five (45) degrees measured from the centerlines of the sanitary sewer and water main.
- (b) A shorter separation distance than that specified in Subsection (a), from above, is allowed if the following is conducted within the separation distances specified in Subsection (a):
- (1) The sanitary sewers be pressure tested to 150 PSI and meet all water main pressure testing requirements as described in 327 IAC 8-3.2-17(a).
 - (2) The sanitary sewer shall be constructed of materials in conformance with ASTM D2241-96b, standard specification for polyvinyl chloride (PVC) pressure-rated pipe, and having a SDR (standard dimension ratio) of 21.
 - (3) The sanitary sewers and water mains are not in contact.
 - (4) Any sanitary sewers joints are a compression type joint that are placed equidistance from the water main.
 - (5) The sanitary sewer and water main are laid on separate trench shelves.
- (c) No sanitary sewer manhole shall be within eight (8) feet of a water main as measured from the outside edge of the sanitary sewer manholes to the outside edge of the water main.

Structure Marking

The following information shall be legibly marked on each precast concrete structure: specification of manufacture, date of manufacture, name or trademark of manufacturer, structure number as designated on the plans.

Structure Inspection

The quality of material, the process of manufacture, and the finish structure shall be subject to inspection and acceptance by the Engineer.

Structure Repairs

Repairs of concrete structures is acceptable, if necessary, because of imperfections in manufacturing or damage during handling, and will be acceptable if, in the opinion of the Engineer, the product conforms to the specifications and will provide the required service life without failure. Depending on the damage, the Engineer may allow the repair to be performed by the contractor or may require the repair to be made by the material manufacturer.

Joints

All joints between the structural components (i.e. casting, grade rings, risers, and base) of the structure shall be sealed with a generous quantity of mastic material. Joints not sealed or damaged during paving shall be disassembled by the contractor, at no additional charge, and resealed.

Grade Rings

Grade rings shall be installed no more than two high and shall extend no more than 12-inches above the primary structure. Exceeding these limitations will require either resetting the structure or replacement of a structural section if multiple sections exist.

Grade rings shall be subject to rejection if fractures or cracks pass through the wall, if surface defects indicate honeycombed or open texture that would adversely affect the structure, if damaged or cracked ends exist that would prevent a satisfactory joint, or any continuous crack having a width of 0.01-inches or more.

Testing

The proposed manholes shall be air tested in accordance with ASTM C1244-93, "Standard Test Method for Concrete Sewer Manholes by Negative Air Pressure (Vacuum) Test". This test shall demonstrate the integrity of the installed materials and the construction procedures. This test method is used for testing concrete manholes sections utilizing mortar, mastic, or gasketed joints. The general requirements of the test are that all lift holes and any pipes entering the manhole shall be plugged. A vacuum of 10 inches of mercury will be drawn and the drop of vacuum to 9 inches of mercury over a specified time will be used to determine the acceptability of the manhole. If the manhole fails the initial test, necessary repairs shall be made by an approved method. The manhole shall be retested until a satisfactory test is obtained.

4. High Density Polyethylene Pipe (HDPE)

General Description

The unit price bid shall include, but not be limited to, all pipe, fittings, joint material, installation of pipe and fittings, excavation and backfill, compaction, dewatering, miscellaneous restoration, thrust blocking as required or as shown on the plans, sheeting, shoring, testing, cleanup, and all other operations necessary to complete the work as shown on the plan or as specified.

Pipe Manufacturer

Pipe shall be manufactured by Plexco, Phillips Driscopipe, or an approved equal.

Pipe Requirements

The pipe material shall be High Density Polyethylene (HDPE) meeting the requirements of ASTM F-714, the latest revision of ASTM D3035, and having a PE code Designation of 3408. The pressure pipe shall have a Pressure Class Rating of 160 pounds per square inch (psi) and a Dimension Ratio of 11 (DR11), unless otherwise identified on the design plans. Pipe sizing shall be based upon the Iron Pipe Size (I.P.S) standard.

The polyethylene materials used to make the pipe and fittings shall contain no ingredient in an amount that has been demonstrated to migrate into water in quantities that are considered to be detrimental to water quality. Pipe material shall be approved by the National Sanitation Foundation (NSF).

Pipe shall be homogeneous throughout and uniform in color, opacity, density, and other properties. The inside and outside surfaces shall be semi-matted to glossy in appearance and free from sticky or tacky material. The pipe walls shall be free from cuts, cracks, holes, blisters, voids, foreign inclusions, or other defects that are visible to the naked eye and that may affect the wall integrity.

Certification

The owner or the specifying engineer may request certified lab data to verify the physical properties of the pipe materials supplied under this specification or may take random samples and have them tested by an independent laboratory.

Rejection

Polyethylene pipe may be rejected for failure to meet any of the requirements of this specification.

Pipe Dimensions

The SDR (Standard Dimension Ratio) of the pipe supplied shall be as specified by the engineer.

Fittings

Polyethylene fittings may be molded, thermoformed from pipe sections, or fabricated by heat fusion joining polyethylene sheet or block. Molded fittings shall meet the requirements of ASTM D2683 for socket-type pipe, or ASTM D3261 for butt-type fittings, and the requirements of this standard.

The same manufacturer shall supply the polyethylene pipe and fittings. Polyethylene pipe and fittings from different manufactures shall not be interchanged.

Molded Fittings

Fittings shall conform to the dimensional requirements set forth in the ASTM D3261. Fabricated fittings shall meet the minimum dimensional requirements and tolerances of the pipe at the point of fusion.

Each fitting shall be designated and manufactured to operate at not less than the design pressure of the pipe system for which it is intended.

Mechanical Joints (MJ)

Mechanical joint connections for HDPE pipe (3-inches through 24-inches in diameter) to ductile iron piping, mechanical joint fittings, or valves shall be through a self-restraining, fusible mechanical joint adapter. Mechanical joint adapters shall be of the same SDR rating as the pipe. A separate, loose stainless steel type insert will only be allowed for pipe sized 3-inch through 8-inch. Mechanical couplings shall be fully pressure rated and fully thrust restrained such that when installed in accordance with the manufacturer's recommendations, a longitudinal load applied to the mechanical coupling will cause the pipe to yield before the mechanical coupling disjoins. External joint restraints shall not be used in lieu of fully restrained mechanical couplings. If an OD compression mechanical coupling is permitted by the Engineer, a stainless steel stiffener shall be installed in the bore of the polyethylene pipe.

Flanged Joints

Flange adapters shall be made with sufficient through-bore length to be clamped in a butt fusion-joining machine without the use of a stub-end holder. The sealing surface of the flange adapter shall be machined with a series of small v-shaped grooves to provide gasketless sealing, or to restrain the gasket against blowout. Flange adapters shall be fitted with back-up rings pressure rated equal to or greater than the mating pipe. The back-up ring bore shall be chamfered to provide clearance to the flange adapter radius. Flange bolts and nuts shall be Grade 2 or higher.

Flange faces shall be centered and aligned to each other before assembling and tightening bolts. Bolt threads shall be lubricated, and flat washers shall be fitted under the flange nuts. Bolts shall be evenly tightened according to the tightening pattern and torque step recommendations of the manufacturer. At least 1 hour after initial assembly, flange connections shall be re-tightened following the tightening pattern and torque step recommendations of the Manufacturer. The final tightening torque shall be 100 ft-lbs or as recommended by the manufacturer.

5. Ductile Iron Water Main

General Description

The bid price shall include, but not be limited to, all pipe of the required sizes, fittings, joint materials, installation of pipe and fitting, bronze wedges, excavation and backfill, removal and disposal of water, miscellaneous restoration, concrete blocking as required or shown on the plans, sheeting, shoring, and protection of existing structures, testing, cleanup, and all other operations necessary to complete the work as shown on the plans or as specified.

Pipe Manufacturer

Pipe shall be as manufactured by Clow, United States Pipe and Foundry, American Cast Iron Pipe Company, Griffin, or approved equal.

The location of the water main may be shifted during the course of construction by the Engineer to avoid interference with existing utilities whose exact location are not known. No additional compensation will be allowed for the shifting of the water main to avoid such interference. In general, the Contractor shall locate all existing utilities prior to the start of the construction.

Pipe Materials

The pipe shall meet the requirements of the latest revision of AWWA Specification C151 and ANSI A-21.51. Ductile iron pipe shall be Thickness Class 50.

Each pipe shall have the weight and class designation conspicuously painted on it. Additionally, each pipe shall have cast on it the manufacturer's mark and the year in which the pipe was cast. The size of the letters and figures shall be as large as practicable.

Pipe connections may be mechanical joints or push-on joints. Mechanical joints shall be of the stuffing box type complying with ANSI A21.11 as modified by ANSI A21.51 for ductile iron pipe. Push-on joints shall comply with ANSI A21.51 for ductile iron pipe.

All pipes shall be furnished with a 1/16" thick cement mortar lining, which conforms in all respects to the latest revision of AWWA C104. The cement mortar lining shall be provided with a seal coat. The exterior of all pipes shall be bituminous coated.

Pipe Gaskets

Pipe with push-on joints shall have their gaskets conform to AWWA C-111 (latest revision). The rubber gaskets shall be made of vulcanized styrene butadiene rubber (SBR) unless otherwise specified by the Engineer. Reclaimed rubber shall not be used. When two hardnesses of rubber are included in a gasket, the soft and hard portions shall be integrally molded and joined in a strong vulcanized bond. Gaskets

shall be free from porous areas, foreign material, and other defects that make them unfit for the use intended.

Gasket Lubricant

Gasket lubricant shall be used to lubricate the parts of the joint for assembly. The lubricant shall be nontoxic, shall not support the growth of bacteria, and shall have no deterioration effects on the gasket material. It shall not impart taste or odor to water in a pipe when used in accordance with AWWA C-600, and the pipe has been flushed according to AWWA C-651. The lubricant containers shall be labeled with the trade name or trademark and the pipe manufacturer's name.

Pipe Installation & Placement

All water mains shall be laid to the alignment and depth shown on the plans unless directed otherwise by the Engineer. All pipes shall be bedded firmly on undisturbed earth with bell holes excavated beneath the bells. Should the Contractor excavate to a depth below the invert of the pipe without the directions of the Engineer, the pipe shall be laid on shaped bedding with compacted granular fill between the pipe and undisturbed earth at the Contractor's expense.

Water main 12-inches and smaller shall be installed with two silicon bronze wedges per joint. Water main 16-inches and larger shall be installed with four silicon bronze wedges per joint. Bronze wedges shall be spaced equally around the circumference of the pipe joint. As each length of pipe is placed in the trench, the joint shall be assembled and the pipe brought to correct line and grade. The pipe shall be secured in place with approved backfill material.

Installed ductile iron pipe shall have a minimum burial depth of 5 feet (60 inches) and may vary to a maximum burial depth of 6 feet (72 inches) from the existing grade to the top of the pipe. Unless deflecting the pipeline to adhere to the project plans, specifications, existing grade or proposed grade, or to readjust the pipes location due to known conflicts, each pipe joint shall be pushed fully home and the pipeline assembly shall appear straight to the eye both horizontally and vertically. Required pipe deflection shall be limited to a maximum of 5-percent deflection per joint unless otherwise specified by the manufacturer.

All pipe, fittings, valves, and hydrants shall be lowered carefully into the trench in such a manner as to prevent damage to water main materials, protective coatings and linings. Under no circumstances shall water main materials be dropped or dumped into the trench. Where necessary, the trench shall be dewatered prior to installation of the pipe.

Examination of Material

All pipe, fittings, valves, hydrants, and other appurtenances shall be examined carefully for damage and other defects immediately before installation. Defective materials shall be marked and held for inspection by the Engineer, who may prescribe corrective repairs or reject the material.

Pipe Ends

All lumps, blisters, and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be wiped clean and dry and be free from dirt, sand, grit, or any foreign materials before the pipe is laid.

Cleaning & Swabbing

If dirt enters the pipe, it shall be removed and the interior pipe surface swabbed with a 1 percent hypochlorite disinfecting solution. If, in the opinion of the Engineer, the dirt remaining in the pipe will not be removed by the flushing operation, then the interior of the pipe shall be cleaned by mechanical means such as a hydraulically propelled foam pig or other suitable device acceptable to the Engineer, in conjunction with the application of a 1 percent hypochlorite disinfecting solution to the interior pipe surface. The cleaning method used shall not force mud or debris into the interior pipe-joint spaces and shall be acceptable to the Engineer.

Pipe Plugs

At times when pipe-laying is not in progress, the open ends of pipe shall be closed by a watertight plug or other means approved by the Engineer. The plug shall be fitted with a means for venting. When practical, the plug shall remain in place until the trench is pumped completely dry. Care must be taken to prevent pipe flotation, should the trench fill with water.

Prior to removal of the plug for extending the line or for any other reason, air and/or water pressure in the line shall be released.

Flooding by Storm or Accident during Construction

If the main is flooded during construction, it shall be cleared of the floodwater by draining and flushing with potable water until the main is clean. The section exposed to the floodwater shall then be filled with chlorinated potable water that, at the end of a 24-hour holding period, will have a free chlorine residual of not less than 25 mg/l. The chlorinated water may then be drained or flushed from the main. After construction is completed, the main shall be disinfected.

Maximum Trench Width

The maximum trench width shall be as shown on the plans unless altered by the Engineer in writing. The additional expense for excavation and pavement replacement made necessary by a wider trench width will be incidental to this item and no additional compensation will be made to the Contractor.

Backfilling

The Contractor shall not backfill water main above the top of the pipe until the alignment and the pipe joints have been checked, inspected and approved by the Engineer.

All main, as soon as laid, shall have the space between the pipe and the bottom and sides of the trench packed full by hand and thoroughly tamped with a shovel or light tamper, as fast as placed in layers not exceeding four (4) inches up to the level of the top of the pipe. The filling shall be carried up evenly on both sides. Care shall be taken that no rock, frozen material, or other hard substances are placed in contact with the pipe.

The main shall be covered by hand to a depth of at least eight (8) inches. The material shall be placed in layers not exceeding four (4) inches in depth, and each layer thoroughly tamped and compacted, with at least one tamping for each man depositing material in the trench.

Material for backfilling the space between the pipe and the bottom and sides of the trench, and for covering to a depth of two (2) feet, shall be clean dry earth, free from stones larger than two (2) inches, frozen material or other hard substances (except for conditions hereinafter defined).

The remainder of the trench shall be backfilled by using the material originally excavated from the ditch (except for conditions hereinafter defined), to a height slightly above the original elevation of the ground. Backfilling shall not be left unfinished for more than 100 feet behind the completed pipe work.

No heavy rock shall be dropped into the trench nor placed within three (3) feet of the pipe. In depositing rock in the trench, care must be taken that the rock does not injure the structure. All spaces between pieces of rock shall be filled with earth to insure there being no voids.

Backfilling from the top of the pipe to final grade shall be made in lifts not exceeding twelve (12) inches in depth, and shall meet the requirements of 98% modified proctor density when beneath pavement and 95% in all other locations.

Testing

Ductile iron water main shall be installed and tested as per the manufacture's instruction and as per AWWA C600 "Installation of Ductile-Iron Water Mains and Their Appurtenances" (latest edition). Pipe shall be disinfected as per AWWA C651 "Disinfecting Water Mains" (latest Edition).

Pressure and bacteria testing of water main shall be performed progressively so that sections may be accepted and put into service and water service connections made.

See "Detailed Specifications – General" regarding "Water System Capacity"

Leakage Test

Leakage shall be defined as the quantity of water that must be supplied into the newly laid pipe, hydrants, and services; or any valved section thereof: to maintain 100 psi pressure after all air has been expelled and the pipeline filled with water.

- 1.) No pipe installation will be accepted if the leakage is greater than that determined by the formula:
Allowable leakage in gallons per hour shall be less than:

$$L = (S \times D) / 7,800 = \text{Gal./Hr.}$$

S = Length of Pipe (Feet)

D = Nominal diameter of pipe (inches)

- 2.) When hydrants are in the test section, the test shall be made against the main valve in the hydrant.
- 3.) Any leakage in excess of the above formula including hydrants, valves, and service connections will be repaired by the Contractor at his own expense.
- 4.) The Contractor shall furnish all pumps, gauges, connections, measuring devices, or any other apparatus necessary to perform the leakage test. Leakage testing will be considered an incidental cost of water main and any cost thereof should be included in the unit prices of other pay items.

Bacteriologic Test

After final flushing, and before the water main is placed in service, 2 water samples, taken 24-hours apart, shall be collected from the new main and tested. At least one set of samples shall be collected from every 1200 feet of new water main, plus one set from the end of the line and at least one set from each branch. All samples shall be tested for bacteriological quality in accordance with Standard Methods for the Examination of Water and Wastewater, and shall show the absence of coliform organisms. If the presence of coliform organisms is detected, the Contractor, at his own expense, shall disinfect and retest the failed section until satisfactory results are obtained. Disinfection and bacteriologic tests are considered incidental of water main and any cost thereof should be included in the unit prices of other pay items.

If trench water has entered the new main during construction or, if in the opinion of the Engineer, excessive quantities of dirt or debris has entered the new main, bacteriological samples shall be taken at intervals of approximately 200 feet and shall be identified by location. Samples shall be taken of water that has stood in the new main for as least 16 hours after final flushing has been completed.

6. Ductile Iron Fittings

General Description

The item includes ductile iron fittings of the respective sizes as shown, or required, and described in the project plans. The Contractor shall furnish all fittings, joint material, installation of pipe and fittings, excavation, backfill, compaction, dewatering, sheeting shoring, and protection of existing structures, testing, miscellaneous cleanup, and all other operations necessary to complete the work as shown on the plans or as specified.

Manufacturer

Fittings shall be manufactured by Clow, United States Pipe, American Cast Iron Pipe, Griffin, Tyler Pipe or approved equal.

Fitting Requirements

Fittings shall comply with all applicable provisions of AWWA C153, latest revision.

Fittings shall have a minimum working pressure of 350 pounds per square inch (psi).

All fittings shall be furnished with mechanical joint type ends meeting AWWA C111 and A21.11, latest revision. At joints where restraint is required, "set screw" retaining glands will be used and standard mechanical joint glands will be omitted. Restraint for additional lengths of pipe beyond fittings shall be calculated using the D.I.P.R.A. method of thrust calculations. Where additional restraint is necessary, mechanical joint pipe with retainer glands shall be used in place of slip joint pipe. Thrust blocking, as shown in the detail, may be used in lieu of additional joint restraints.

Fitting Identification

Each fitting shall have distinctly cast upon it the following information: manufacturer's mark, nominal diameters of all openings and the fraction of the circle on the bends. The letters and figures shall be cast on the outside and shall be as large as practicable.

Lining and Coating

Fittings shall be ductile iron and furnished with a 1/16-inch thick cement mortar linings which conform in all respects to the latest revision of AWWA C104. The cement mortar lining shall be provided with a seal coat. Fittings shall be bituminous coated on the outside.

Mechanical Joint Retaining Glands

Glands shall conform to applicable portions of AWWA C110, latest revision, and shall be manufactured from ductile iron. Each gland shall have a sufficient number of double heat treated parkerized steel square headed set screws, with cup points. When installed with 75 foot pounds of torque, the cup points shall bite into the surface of the pipe and prevent blow off or movement of the joint at a line pressure up to 200 pounds per square inch (psi). Glands shall be of the same manufacture as the fitting body and be equivalent to Clow fig. 1058.

Alternate joint restraint systems other than those discussed above will be substituted only after review and written approval by the Engineer.

Incidental Items

The cost of restraining glands shall be considered incidental to and included in the bid price for the ductile iron fittings.

7. Valves and Boxes

General Description

This item shall include, but may not be limited to wedge and butterfly valves of various sizes, valve box, connecting pipe, joint materials, installation of pipe and fittings, excavation and backfill, removal and disposal of water, miscellaneous restoration, concrete blocking as required or shown on the plans, sheeting, shoring, and protection of existing structures, testing, cleanup, and all other operations necessary to complete the work as shown on the plans or as specified.

Manufacturer

Valves shall be manufactured by Clow, Mueller, or approved equal.
Valve Boxes shall be manufactured by Tyler Pipe Industries, or approved equal.

Valve Requirements

Wedge valves shall be used on all water main 8" in diameter and smaller. Valves on water main 10" and larger shall be of the butterfly type.

All wedge valves furnished under this item shall conform to AWWA C509, latest revision. Butterfly valves shall conform to AWWA C504, latest revision. End connections shall conform to AWWA C111, latest revision, for mechanical joints.

All valves shall be tested at a minimum of twice the working pressure of 200 psi.

The number of turns to operate the valve shall be gauged to closely resemble conventional distribution valve practices, and to minimize water hammer. The operating nut shall be a standard 2" AWWA nut.

Wedge Valves

Wedge shall be ductile iron, fully encapsulated in synthetic rubber except the guide and wedge nut areas. Synthetic rubber shall be molded in place and bonded to the wedge; mechanical fasteners are not allowed. Stem shall be sealed by at least two O-rings contained within the stuffing box. All stem seals shall be replaceable with the valve wide open and while subjected to full rated pressure. The interior of the valve shall be coated with liquid applied epoxy and the exterior of the valve shall be coated with liquid applied epoxy or asphalt enamel, or approved equal.

Butterfly Valves

Butterfly valves shall be coated on the inside with liquid applied epoxy and the exterior of the valve shall also be coated with liquid applied epoxy or asphalt enamel or approved equal. The body, disc, shaft, seats, bearings and operators shall be designed based on Class 150B and may be of the short or long body type. The seat-ring shall be made of rubber, located in the body. The shaft may be of the through type or stub type and shall be marked on the end to indicate the position of the valve disc with respect to the shaft.

The valve disc shall be of the corrosion-resistant alloy cast iron. The valves shall be equipped with a stainless steel stop in the body to prevent the disc from rotating through the closed position. The shaft seals shall be permanently lubricated and sealed for buried service. The operator shall be constructed such that the valve will open when the nut is turned to the left or in a counterclockwise direction. Operators for valves sixteen inches and twenty inches in size may be traveling nut or worm gear type. Operators for twenty-four inch and larger shall be of the worm gear type.

Butterfly valves shall be supplied complete with all accessories.

Valve Boxes

All valve boxes shall be cast iron, screw type boxes with the work "Water" cast in the lid. The valve boxes shall be five and one-quarter (5¼) inch shaft size and three piece type with a round base. The box shall have an enlarged bottom section, and a top section with cover. The cover shall be marked "Water". The valve box shall be adjustable from 46 to 72 inches.

Incidental Items

Joint accessories shall be considered incidental.

When the water main cover is specified to be deeper than 72 inches, valve box extensions and gate valve extension keys shall be included as incidental items. Extension keys shall have a minimum of a 1 inch shaft.

8. Tapping Valve and Sleeve

This bid item shall include, but shall not be limited to, the tapping valve, valve box, tapping sleeve, connecting pipe, joint materials, installation of valve, sleeve and fittings, excavation and backfill, removal and disposal of water, miscellaneous restoration, concrete blocking as required or shown on the plans, sheeting, coring, protection of the existing structure, testing, cleanup, and all other operations necessary to complete the work as shown on the plans or as specified.

Tapping Valve Manufacturer

Valves shall be manufactured by Clow, Mueller or an approved equal.

Tapping Sleeve Manufacturer

Sleeves shall be stainless steel and manufactured by Mueller H304, Ford FTSC, Romac FTS or an approved equal.

Valve Box Manufacturer

Valve box shall be manufactured by Tyler Pipe Industries, or approved equal.

Valve Requirements

Tapping valves furnished under this item shall conform to the latest revision of AWWA Standard C-509 except as otherwise specified.

Tapping valves shall be of the type suitable for installation with the corresponding tapping sleeve, and are not to be confused with standard gate valves.

End connections shall conform to the latest revision of AWWA Standard C-111 for mechanical joints. All valves shall be resilient wedge with mechanical joint ends, 200 psi working pressure, non-rising stem, O-ring seals, open left (counter clockwise) with an operating nut and 2-inch square wrench nut.

Valve stems shall be high strength manganese bronze having a minimum tensile strength of 80,000 psi, minimum yield strength of 32,000 psi and minimum elongation of 15% in two inches.

Stem seals may be of the O-ring type.

All valves shall be tested at a minimum of twice the working pressure of 200 psi.

Tapping Sleeve

Tapping sleeves shall comply with all applicable provisions of the latest revision of AWWA Standard C-110. Fittings shall be Class 350.

The tapping sleeve shall be built in two sections, designed to be assembled around the existing mains without halting service. Bolts for fastening together the two sections shall be stainless steel, closely spaced, and located so as to assure uniform gasket pressure. The sleeve outlet shall provide for a flanged connection. Tapping sleeves shall be furnished complete with joint accessories and shall be designed to fit all classes of pipe.

The sleeve shall have distinctly cast upon it, as large as possible, the following information: manufacturer's mark, nominal diameters of all openings and the fraction of the circle on all bends.

Valve Box

All valve boxes shall be cast iron, screw type boxes with the work "Water" cast in the lid. The valve boxes shall be five and one-quarter (5¼) inch shaft size and three piece type with a round base. The box shall have an enlarged bottom section, and a top section with cover. The cover shall be marked "Water". The valve box shall be adjustable from 46 to 72 inches.

9. Fire Hydrant Assembly

General Description

This bid item shall include, but not be limited to: tee at main, hydrant, auxiliary 6-inch wedge valve and box, tie rods (or lug retaining glands), 6-inch pipe (as specified for the water main), connecting pipe fittings, joint material, installation of pipe and fittings, excavation, backfill, compaction, dewatering, miscellaneous restoration, concrete blocking as required or shown on the plans or as specified, sheeting, shoring, and protection of existing structures, testing, cleanup, hydrant marking sign, and all other operations necessary to complete the work as shown on the plans or as specified.

Manufacturer

Hydrants shall be Kennedy model K-81, American B84B-5, or approved equal.

Hydrant Standards

Hydrant shall be manufactured in accordance with AWWA C-502 (latest addition), have an Underwriters Laboratories, Inc. listing, and a Factory Mutual Research approval.

Hydrant Construction

Hydrants shall have a 6-inch inlet connection, a 5 1/4-inch hydrant valve, a 7-inch internal barrel diameter, and a metal wall thickness no less than 9/16-inch.

Inlet hydrant joint shall be a mechanical joint and shall be mechanically connected to the hydrant assembly using lug retaining glands.

The base of the hydrant barrel shall be a minimum of five feet, six inches below grade.

All working parts of the hydrant shall be removable from the top of the hydrant without digging and without the use of a lifting device or special tools. Hydrant top casting is to be removable without shutting off the auxiliary water inlet valve.

Hydrant shall be of the compression-type closing with the line pressure.

The valve opening shall be 5 1/4-inch in diameter. The main valve assembly shall be designed so the bronze seat ring threads into a bronze bushing in the shoe allowing the seat ring to be removed from above ground without excavation.

The bonnet section shall be designed so all bearing surfaces and stem threads are sealed in a lubricant reservoir and automatically lubricated each time the hydrant is operated. Hydrant shall be shipped complete with lubricant.

The hydrant shoe shall have a 6-inch mechanical joint inlet and at least two drain plugs.

Hydrants furnished with a breakable feature that will break cleanly upon impact. This shall consist of a two-part breakable safety flange and stem coupling or breakaway lugs and breakaway stem coupling. It shall be designed to permit 360-degree rotation of the upper barrel without removal of the ground line flange bolts. Those depending on breakable bolts only, at the ground line flange as a safety device, will not be acceptable. The breakaway flange shall be set between 2-inches and 6-inches above grade.

Hydrant Outlets

Hydrant outlets shall include two (2) 2-1/2 inch nozzles, and one (1) 4-1/2 inch nozzle. Nozzle threads shall conform to ASA B-26 for "National Standard Fire Hose Coupling Screw Threads."

Hydrant Color

Hydrants shall be painted yellow.

Hydrant Open Direction & Operating Nut

Hydrant shall open left (counter-clockwise) and have 1 1/4 -inch square operating nut.

Hydrant Warranty

Hydrant shall be backed by a 10-year manufacturer warranty. Warranty shall be provided to City in written form prior to project acceptance.

Water System Pre-Approval

New hydrants shall be bagged with burlap or of other approved rugged material, and sufficiently secured until final acceptance of the project, or portion thereof, by the Engineer and/or Owner. The cost to install and remove the required covering shall be incidental to the bid item.

10. Water Service

General Description

The bid shall include, but not limited to, water main tap, corporation stop, service line, curb stop, curb box and lid, curb box key, adapter fitting, tracer wire, excavation, backfilling, compaction, and all other operations necessary to complete the work as shown on the plans or as specified.

Manufacturer

Pipe shall be manufactured by Plexco, CSR, or an approved equal.

Corporation stops shall be manufactured by Ford or A.Y. McDonald Mfg.

Curb stops shall be manufactured by Ford or A.Y. McDonald Mfg.

Curb boxes shall be manufactured by Ford or A.Y. McDonald Mfg.

Curb box stationary rods shall be manufactured by the same manufacturer as the installed curb box.

Contractor is referred to the water main detail sheet for specific corporation stop and curb stop manufacturer model numbers.

Pipe Materials

Water main services shall be one (1) inch high density polyethylene (HDPE) DR9 in accordance with AWWA C800, AWWA C901, ASTM D2737, ASTM D3350, NSF-14, and NSF-61.

Corporation Stop

Corporation stop shall be of the plug valve type having an AWWA\C.C. inlet tread and a compression outlet connection.

Taps into the water main shall be made so that corporation stop is installed 45 degrees from the vertical axis of the main.

Curb Stop

Curb stop shall be of the ball valve type having a compression inlet and outlet connection. Exception to the compression outlet is permitted when reconnection to existing galvanized pipe is required.

Curb Box & Lid

Curb box shall be an adjustable height 1" upper section Arch Pattern curb box. Curb box length shall be 6-inches longer the designated burial depth to allow for final grade adjustment.

Curb boxes located outside of paved areas shall be provided a 2-hole Erie Pattern. Curb boxes located within paved areas shall be provided with a Plug style standard pentagon brass plug.

Curb box base shall be cast gray iron, the upper section shall be steel, and the curb box cover shall be cast gray iron with the lettering "WATER". All portions of the box shall be black dip coated.

Each curb box shall be supplied with a stationary rod that is 18-inches shorter than the maximum extension of the curb box for curb stop operation. The stationary rod shall be connected to the curb stop using a 1-1/4" brass cotter pin.

Water Service Burial Depth

Water services shall have a minimum burial depth of 60-inches, and shall be installed 90 degrees to the main in alignment with the existing water service.

Water Service Replacement Limits

Water services shall be replaced from the water main to the right-of-way.

Tracer Wire

Non-metallic water services shall be installed with electrically continuous insulated 12 gauge (minimum) AWG single conductor copper-clad carbon steel wire coated with a minimum 30 mil polyethylene jacket designed specifically for buried use. The insulating jacket shall be colored either white or yellow. Wire shall be loosely installed during conduit installation and shall be on average within one-inch (1") of the installed conduit. Tracer wire shall be Reinforced Tracer Wire as manufactured by Copperhead Industries, LLC, P.O. Box 1081, Monticello, MN 55362, or approved equal.

The tracer wire shall terminate at finished grade around the curb stop valve.

Property Owner Notification

Contractor shall provide written notification to each property owner/tenant that their service is going to be reconnected to the new water main. Written notification shall be provided 24 hours prior to replacing a service connection. Disconnection to water service shall not exceed 2-hours.

Existing Water Service Materials

City does not maintain records on existing water service materials. Contractor shall be prepared to reconnect to all material types (i.e. copper, galvanized, lead, polyethylene, etc.).

Water Service Damage, Private Side

Damage to the private side of an existing service or its mechanicals during construction shall be the sole responsibility of the Contractor. This includes corrective time, materials, and labor.

Deteriorated Water Service, Private Side

If a water service is deemed too deteriorated to reconnect to and the extent of the deterioration is agreed to by a City representative, the Contractor will be paid per linear foot until suitable existing material can be reconnected to.

The Contractor shall connect the service line to the existing service line (whatever the existing material might be) after the new curb stop. Connection to service lines of dissimilar material or size will not be paid for directly and shall be included in the cost of the water service.

Incidental Items

The cost of tracer wire and pipe material transition fittings and parts from new to old water service shall be incidental to bid price for the water service pipe.

Incidental to the curb box line item one stationary rod key shall be supplied to the Water Utility for every 10 installed curb boxes.

Incidental to the curb box line item one pentagon key shall be supplied to the Water Utility for every 10 Plug style covers installed.