MICHIGAN

DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION

FOR

**WATER MAIN MATERIALS AND CONSTRUCTION**

KZO:KAD 1 of 12 APPR:CJD:RPB:10-04-24

**a. Description.** This work consists of installing the following materials as part of the city of Kalamazoo’s water system. Unless otherwise noted below, ensure all work, materials, construction requirements, and methods of measurement and payment are in accordance with the standard specifications.

**b. Submittals**. Submit PDF product data consisting of shop drawings and manufacturer’s literature to the Engineer and the city of Kalamazoo for approval at least 10 working days prior to construction.

**c. Materials.** Unless otherwise specified, furnish materials in accordance with *ANSI/AWWA*, subsection 823.02 of the Standard Specifications for Construction, and as specified herein. The specific items listed below conform to city of Kalamazoo water system requirements and no substitutions are permitted.

1. Pipe. Ensure DI pipe is manufactured in accordance with *ANSI/AWWA C150/A21.50* and *C151/A21.51* and is a minimum thickness Class 52 pipe.

A. Underground pipe must use push on or mechanical joints meeting the requirements of *ANSI/AWWA C111/A21.11*. Use nitrile or fluoroelastomer gaskets as shown on the plans and in locations of known or suspected soil or groundwater contamination as necessary. Furnish gaskets based on the type of contamination that is encountered. Each joint must contain serrated silicon bronze electrical continuity wedges as directed by the Engineer or authorized by the city of Kalamazoo representative. Four to six inch pipe must use 2 wedges, 8 to 12 inch pipe must use 3 wedges, pipe 16 inch and larger must use 4 wedges.

2. Restrained Joints.

A. Ensure mechanical restrained joints are EBAA Iron Inc. Megalug series 1100, Romac Romagrip, Ford Series 1400, or Engineer approved equal.

(1) Restraint devices for nominal pipe sizes 4 inch through 54 inch must consist of multiple gripping wedges incorporated into a follower gland meeting the applicable requirements of *ANSI/AWWA C110/A21.10*.

(2) The devices must have a working pressure rating of 350 psi for 4 to 16-inch pipe, 250 psi for 18 to 48-inch pipe, and 200 psi for the 54-inch pipe sizes. Ratings are for water pressure and must include a minimum safety factor of 2 to 1 in all sizes.

(3) Cast gland body, wedges and wedge actuating components from grade 65-45-12 DI material in accordance with *ASTM A536*.

(4) Heat treat DI gripping wedges within a range of 370 to 470 Brinell hardness number (BHN).

(5) Ensure all components are manufactured and assembled in the United States.

(6) Ensure coating for restraint devices is as follows:

(a) Ensure all wedge assemblies and related parts are processed through a phosphate wash, rinse and drying operation prior to coating application. The coating must consist of a minimum of two coats of liquid thermoset epoxy coating with heat cure to follow each coat.

(b) Surface pretreat all casting bodies with a phosphate wash, rinse and sealer before drying. Apply the coating electrostatically and heat cure. Ensure the coating is a polyester based powder to provide corrosion, impact and UV resistance.

(c) Ensure the coating system is MEGA-BOND by EBAA Iron, Inc. or Engineer approved equal.

B. Ensure push on restrained joint is field locking gasket style or flex ring style as manufactured by US Pipe, McWane, American USA, or Engineer approved equal. Field locking or flex ring gasket must match appropriately to the manufacturer of the pipe used.

C. Unless otherwise approved by the Engineer, do not use threaded rods or thrust blocks as a joint restraint.

3. Ductile Iron Pipe Fittings. Fittings, plugs, and gaskets must meet the requirements of *ANSI/AWWA C111/A21.11*, and *AWWA/ANSI C110/A21.10* or *ANSI/AWWA C153/A21.53*. Cement mortar linings for fittings must meet the requirements of *ANSI/AWWA C104/A21.4*.

A. Ensure mechanical joints are EBAA Iron Megalug series 1100, Romac Romagrip, or Engineer approved equal.

B. Ensure restrained flange adapters are EBAA Iron Megaflange series 2100 or Engineer approved equal.

4. Ductile Iron Valves.

A. Ensure all underground valves in sizes from 4 inches to 10 inches are reduced wall, resilient-seated gate vales for water supply service meeting the requirements of *AWWA C515*. Ensure valves are American Flow Control series 2500, Clow model 2638, or East Jordan Iron Works EJ Flowmaster series resilient seated gate valve, mechanical joint with rubber gaskets (per *AWWA/ANSI C111/A21.11*), DI body, stainless steel stem, mechanical joint restraint, and 3/4 inch tee head bolts. Valves must open right (clockwise) and be equipped with standard *AWWA* operating nut. Ensure nut is color coded red. Valves must have a working pressure rating of 250 psi or greater.

B. Ensure all underground valves 12 inches and larger are rubber-seated butterfly valves meeting the requirements of *AWWA C504*. Butterfly valves will be furnished by the city of Kalamazoo. Contact the following to arrange for pickup of the butterfly valves.

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C. Ensure all valves installed using the insertion style method are all stainless-steel body resilient wedge gate valve designed for permanent use in potable water systems. The design must allow the valve to be installed into an existing pressurized pipeline while maintaining constant pressure and service without system shutdown. Ensure no restraining devices, restraining fasteners, or transition gaskets are required for the installation or operation of the valve. Ensure valves in sizes 4 inches to 12 inches are Hydra-Stop Insta-Valve 250 or Engineer approved equal. Ensure 16-inch valves are Hydra-stop Insta-Valve Plus 250 or Engineer approved equal.

5. Hydrants. Ensure all fire hydrants are American Flow Control, EJ, or Engineer approved equal and must meet the requirements of *AWWA C502*. Ensure hydrants are furnished as complete units including hydrant, hydrant marker, pipe, pipe fittings and valve meeting subsections c.1, c.4 and c.6 requirements of this special provision. Ensure hydrants are supplied for a bury depth of 5.5 feet. Paint the hydrant barrel safety yellow by the manufacturer. Ensure hydrant caps and operating nuts are painted John Deere green by the manufacturer.

A. Ensure American Flow Control hydrants are 5¼ inch Waterous Pacer Traffic Model WB67-250. Ensure hydrants are supplied with a 16-inch upper standpipe length. The hydrant must come equipped with a bronze upper valve washer. In lieu of a mechanical joint restraint, hydrants may be equipped with ALPHA joints.

B. Ensure EJ hydrants are WaterMaster Model 5BR250 with snow barrel.

C. Hydrants must come equipped with a Carrol Drain. Ensure drain piping is made of Type 304 stainless steel. External port must have removable cap for flushing hydrant. Construct Carrol Drain assembly so that it is removable when replacement of assembly is necessary.

D. Hydrants must have two 2½ inch national standard hose connections, 7.5 threads per inch, outside diameter of threads 31/16 inch and one 5-inch integral Storz type nozzle connection. Ensure hose nozzle cap nut, weather shield hydrant operating nut, Storz nozzle cap nut, and Carrol Drain cap nut are square 15/16 inch at bottom of nut tapered to 13/16 inch at top (Waterous reference #19). Ensure the hydrant mechanism is on a non-rising stem opening clockwise. Do not supply chains with the hydrant caps.

E. Equip hydrants with drip valve, tapped for plug. Ensure the drip valve system is bronze. Ensure draining system is positively activated by the main operating rod, meaning the drip valve will open when the hydrant is closed. Furnish hydrant with plug removed.

F. Hydrants must have a 6-inch shoe with mechanical joint connections in accordance with *ANSI/AWWA C115/21.11*.

6. Hydrant Marker. Hydrant marker included with Fire Hydrant pay item.

A. Install the fire hydrant sign on a galvanized 2-pound signpost.

B. Ensure the fire hydrant sign is aluminum 8-inch by 18-inch (MDOT type III-A) with hydrant symbol and down arrow of a reflective material as shown on the plans.

C. Ensure fire hydrant mounted marker whips are 4 feet by 3/8-inch solid pultrusion fiberglass shaft, with seven 6-inch bands of engineering grade reflective sheeting of alternating lime green and red color. Marker must have a single solid stainless-steel spring with aluminum threaded insert and use zinc coated bolt and mounting hardware.

7. Polyethylene Encasement. Ensure polyethylene encasement is manufactured using 8 mil thick virgin polyethylene in accordance with *ANSI/AWWA C105/A21.10*. Furnish the tube size recommended by the manufacturer to protect the pipe and fitting sizes. Furnish adhesive tape for the polyethylene tube as recommended by the manufacturer. Tape for repairing damage to the polyethylene must have a life expectancy equal to or greater than the life expectancy of the polyethylene.

8. Water Services and Appurtenances.

A. Copper Service Lines.

(1) Use copper pipe for service lines which are 1¼ inch and 2-inch. Ensure all copper services are *ASTM B88*, type K in accordance with *AWWA C800*.

(2) Ensure all appurtenances on copper service lines are flare copper connections. Other connections may be used in lieu of flare copper connections if approved by the Engineer prior to installation.

B. All water service appurtenances must meet the requirements of *AWWA C800* and be from The Ford Meter Box Company, Inc., A.Y. McDonald Mfg. Co., or as approved by the Engineer. Ensure all brass fittings such as tees, elbows, caps, nipples and similar items are manufactured in the United States of America. All water service appurtenances for 2 inch and smaller are as follows:

(1) 1¼ inch services.

(a) Corporation Stop - Ford FB600-45-NL or AY McDonald 74701B NL (1 by 1¼ inch)

(b) Service Saddle - Smith-Blair 311(4 to 12 inch water main), Smith-Blair 313 (16 to 24 inch water main), Romac 101U (4 to 12 inch water main), Romac 202SSU (16 to 24 inch water main), Ford F101(4 to 12 inch water main), or Ford F202(16 to 24 inch water main)

(c) Curb Stop - Ford B22-555-NL or AY McDonald 76100 NL (1¼ inch)

(d) Couplings - Ford C22-55-NL or AY McDonald 74758 NL (1¼ inch)

(2) 2-inch services.

(a) Tapping Valve - Ford B11-777-NL

(b) Service Saddle - Smith-Blair 313, Romac 202S, or Ford F202

(c) Couplings - Ford C44-77-NL

C. Ensure all water service appurtenances larger than 2 inch are in accordance with subsection c.1 Pipe in this special provision.

9. Valve Boxes.

A. Ensure valve boxes used for gate valves, butterfly valves, and 2 inch services are in accordance with *AWWA M44* for cast-iron valve boxes. Include a slide or screw-type top section, malleable iron casing in accordance with subsection 908.03 of the Standard Specifications for Construction with two- or three-piece screw type adjustable extension length as required for depth of burial of the valve, and a cover with lettering “WATER”. Furnish a bottom section with a base of adequate size to fit over the valve and an approximately five-inch diameter barrel. Furnish boxes manufactured by American Waterous, Clow Corporation, East Jordon, Tyler Union 6860 series (manufactured in the United States of America), or Engineer approved equal.

B. Curb Stop Boxes for 1¼ inch Service - Bingham & Taylor Fig. No. 4901-B, 94-F with 2½ inch New Style Flush Fit Cover or approved equal. Inscribe cover with the word “water”. Ensure curb stop box extensions are cast iron and manufactured by Bingham & Taylor, capable of being mounted directly to the curb stop box.

C. Valve Vaults for Insta-Valves. Ensure valve vaults used in conjunction with Insta-Valves are constructed with materials as detailed on the plans (detail WA-8-A). Ensure they are of the diameter specified and in accordance with subsection 823.02 of the Standard Specifications for Construction for gate wells.

10. Line Stop Tapping Sleeves and Appurtenances.

A. Use model Hydra-Stop HSF 250 Patriot or approved equal.

B. Ensure body is Type 304 stainless steel in accordance with *AWWA C223*.

C. Ensure blind flange is epoxy coated carbon steel or Type 304 stainless steel.

D. Ensure bolts, nuts and washers are Type 304 stainless steel.

E. Ensure completion plug is Hydra-Stop HSF 250 Push and Pin Style, made of reinforced composite polymer.

F. Ensure completion plug O-ring is BUNA-N rubber.

G. Ensure completion plug pins are *SAE Grade 8*, zinc coated to prevent corrosion.

H. Ensure completion pin plug is Type 304 stainless steel, coated to prevent galling.

I. Ensure flange O-Ring is BUNA-N rubber.

11. Insulation Board. Furnish insulation that is rigid, extruded polystyrene board meeting *ASTM C578*, Type VII, having a nominal board thickness of 2 inches, minimum compressive strength of 60 psi (*ASTM D1621*), minimum R value of 5.0 °F square-foot hour per British thermal unit (°F ft2 h/BTU) per inch and 0.1 percent max water absorption (*ASTM C272/C272M*). Furnish the board in minimum 4 foot by 8-foot sheets unless otherwise approved by the Engineer, and of the cumulative thickness as shown on the plans or as determined at the time of construction and approved by the Engineer. Trim the edges square and ensure there is not more than 1/4-inch bow measured against a straightedge.

Furnish granular backfill, Class II in accordance with subsection 902.07 of the Standard Specifications for Construction.

**d. Construction.** Perform construction in accordance with section 823 of the Standard Specifications for Construction and as specified herein.

1. General. The city of Kalamazoo will open or close in service valves and furnish on-site inspections for all water main and water service installations. If the operation of valves in existing water mains is required, notify the city of Kalamazoo a minimum of 5 working days in advance.

A. Limit out of service time for existing water mains to 4 hours and furnish minimum 72 hours advance notice to the City’s Project Manager prior to planned service interruptions.

B. Ensure no trees or permanent structures are placed within 10 feet of the centerline of the water main or service line.

2. Laying of the pipe.

A. Wash the inside of all pipe and fittings with chlorinated water (50 to 200 parts per million) immediately prior to placement in the trench. Ensure water pressure during washing does not exceed 150 psi or manufacture’s recommendations.

B. Tie rods or thrust blocks are not allowed unless approved by the Engineer or authorized city of Kalamazoo representative.

C. Ensure proper actuation of the gripping wedges of the mechanical joint restraint with torque limiting twist off nuts.

D. Ensure pipe is laid with bell ends facing the direction of laying, unless otherwise directed by the Engineer or authorized city of Kalamazoo representative. When pipe is laid on a grade of 10 percent or greater, the laying must start at the bottom and proceed upward with the bell ends of the pipe upgrade.

E. Install silicon bronze wedges between all push-on joint pipes to allow for underground location and thawing of pipeline. Ensure 4 to-6-inch pipe uses 2 wedges, 8 to 12-inch pipe uses 3 wedges, and 16-inch and above uses 4 wedges at each pipe joint.

F. Restrain pipe in accordance with the Table on the plans.

3. Valves.

A. Prior to installation, ensure all valves are fully operated open and closed to verify its functionality and number of turns. Install anchor coupling with valves installed on tees or crosses, with swivel gland located on the valve side of the anchor coupling.

B. When installing 12-inch and larger valves (butterfly valves), ensure the operating nut is located on the side of the valve furthest from the centerline of the roadway, unless otherwise directed by the Engineer.

C. Ensure all butterfly valves adjacent to a tee or cross includes one anchor coupling (solid mechanical joint connecting pieces) between the fitting and the valve.

4. Live Taps to In Service Water Mains.

A. Use equipment which allows the tapping machine to rinse out metal shavings and tap water main per manufacturer’s recommendations. No tap 4 inches or larger will be allowed within 4 feet from any joint, fitting, or exiting tap regardless of location of tap. Ensure 1¼ inch taps located within 10 feet of a previous tap are offset 15 degrees. Ensure 1¼ inch and 2-inch taps are at least 2 feet from other taps or joints.

B. Disinfect all exposed water main and appurtenances with chlorinated water once tapping is complete.

5. Valve Boxes. Ensue the area around the valve box is backfilled with granular material, Class II placed in layers not to exceed 12 inches, and thoroughly compacted to the required density. Prevent the box from shifting during backfilling operations. Ensure the tops of the valve boxes are flush with the pavement or ground surface.

6. Water Services.

A. Do not connect water services to the water main until approved by the Engineer or authorized city of Kalamazoo representative..

B. Tap water main per subsection c.4 of this special provision.

C. Water Services 2 inch and Smaller.

(1) Construct services from the distribution main to the Right-of-Way. Lay services in a straight line perpendicular to the water main unless approved by the Engineer. Construct service with a continuous piece of copper from the corporation stop to the curb stop unless approved by the Engineer or authorized city of Kalamazoo representative.

(2) Locate all couplings as close to the water main as possible, but outside roadway unless approved by the Engineer.

(3) The use of thread sealant is not allowed on flared fittings.

(4) Splices are not allowed for 1¼ inch or smaller yard services 90 feet and shorter in length.

(5) Ensure tap and curb shut off locations are no closer than 5 feet to edge of driveways. If a new service is required to be abandoned due to improper location, ensure service is fully abandoned at the water main tap location and new service installed at the Contractor’s expense. Ensure corporation stop is shut off, copper piping removed, and copper disc installed on the corporation stop.

7. Water Mains, Cut and Plug. Ensure all work related to water main, cut and plug is in accordance with subsection 823.03.E of the Standard Specifications for Construction. If the plans show cutting and plugging water mains, arrange for the city of Kalamazoo to shut down the main at least 72 hours in advance. Remove the section of pipe, plug the water main, and construct the required restraint as shown on the plans or as approved by the Engineer.

8. Hydrant.

A. Set fire hydrants at the locations shown on the plans and in accordance with city of Kalamazoo standard plans and manufacturer’s recommendations or as coordinated with the city of Kalamazoo. When installed, ensure the hydrant is located on the side of the water main furthest from the centerline of the roadway, unless otherwise directed by the Engineer. Place the nozzles at the height specified by the city of Kalamazoo.

B. For all gate valves connected adjacent to a tee or hydrant, the anchor between the fitting or hydrant and the valve must be a 6 inch by 13-inch swivel by solid adapter with swivel gland. Locate the swivel gland on the hydrant side of the solid adapter.

C. Install a valve box over hydrant valve in accordance with subsection c.5 Valve Boxes of this special provision.

D. Place a protective cover over hydrants prior to backfilling to reduce the risk of damaging the hydrant. If hydrant is damaged, repair or replace the hydrant at no cost to the contract.

E. Ensure hydrant drip valve plug(s) are included with the hydrant.

9. Hydrant Marker.

A. Locate the sign between the hydrant and curb and offset from the pumper nozzle, or as directed by the Engineer. Place the sign 3 feet away from the hydrant. Ensure the sign is single sided or double sided as directed by the Engineer. The sign must have an installed height to the bottom of the sign of 7 feet above the final grade in areas with sidewalk and 5 feet above the final grade in areas without sidewalk.

B. Install a fire hydrant mounted whip in addition to fire hydrant sign as approved by the Engineer. Mount fire hydrant whip to the fire hydrant opposite the pumper nozzle in accordance with the manufacturer’s specifications.

10. Hydrant Removal.

A. Close the auxiliary valve and remove the hydrant standpipe to at least 4 feet below the planned grade.

B. Cap or grout the remaining standpipe section soil tight.

11. Backfilling and Compacting.

A. Backfilling Under Existing Conduits. Where it is necessary to undercut or replace existing utility conduits and/or service lines, ensure the excavation beneath such lines is backfilled the entire length with granular bedding material tamped in place in 6-inch layers to the required density. The granular bedding must extend outward from the spring line of the conduit a distance of 2-feet on either side and thence downward at its natural slope.

B. Backfilling with Excavated Material. Unless otherwise specified or directed, ensure material excavated in connection with the work is used for backfilling and other filling purposes, if it meets all requirements given elsewhere in this special provision.

C. Backfill Immediately Following Inspection. Ensure all trenches and excavations are backfilled immediately after pipe is laid therein, unless otherwise directed by the Engineer or authorized city of Kalamazoo representative. Under no circumstances is water permitted to rise in un-backfilled trenches after pipe has been placed.

D. Ensure service leads are not backfilled until the pipe ends are referenced and the Engineer or authorized city of Kalamazoo representative has measured the pipe for payment.

E. Ensure backfilling around and over structures and pipes is performed by hand and tamped with suitable tools of approved weight to a point 1-foot above the top of pipe. Ensure MDOT Standard Plan R-83 Series backfill material is used in this area. Ensure the material is placed in uniform layers not exceeding 6-inch in depth up each side. Place each layer, then carefully and uniformly tamp to the specified density so as to eliminate the possibility of lateral displacement of pipe or structure.

F. Backfilling by Machinery. After the backfill has been placed and compacted around the boxes and pipe to a height of 1-foot above the top the remainder of the trench may be backfilled by machine. Deposit the backfill material in horizontal layers and compact each layer to the specified density by approved methods before a succeeding layer is placed. In no case can backfill material from a bucket be allowed to fall directly on a structure or pipe and in all cases lower the bucket so that the shock of the falling material does not cause damage.

12. Compaction Requirements. Compact each layer to 95 percent (90 percent if outside the influence of the roadway) maximum density as tested by the *Density Testing and Inspection Manual*.

13. Testing and Chlorination. Perform hydrostatic testing in accordance with *AWWA C600* and bacteriological testing in accordance with *AWWA C651*. The city of Kalamazoo representative must witness pressure testing. Give the city of Kalamazoo at least 1 full working day notice before testing.

14. Polyethylene Encasement. Install polyethylene encasement on water mains and fittings as shown on the plans in accordance with the manufacturer’s installation instructions and *AWWA/ANSI C105/A21.10*. Use appropriately sized polyethylene encasement so that there are no longitudinal spaces. This may require using one or more size larger diameter encasement than the pipe installed.

15. Installation of Insertion Valves.

A. Perform insertion valve installation in the locations as detailed on the plans or as directed by the Engineer. Prior to installing insertion valve, coordinate the deactivation of the water main so that all customers have been given proper notification of the shutdown. No work can be performed without approval of the Engineer.

B. Excavate and expose the water main. Remove scale from the water main and make sure there are no flaws which would affect the seal with the saddle.

C. Insertion Valves.

(1) Install insertion valve body on the pipeline and perform valve insertion in accordance with manufacturer’s instructions. Operate the valve to ensure that it is fully functional.

(2) Construct valve vault as detailed in WA-8-A on the plans. Ensure that all as built information is recorded and submitted as required.

16. Insulation Board.

A. It is necessary to insulate the water main or service lines wherever indicated on the plans or determined by the Engineer. Hand dig as necessary to verify the location of the water main or service line. Place the insulation board on a prepared grade on either side of the pipe and on top of the pipe, adjacent to the pipe and bedded with granular material, class II. Fasten the insulation board with skewers or other means approved by the Engineer, so that backfill compaction requirements of the trench can be met. Trim the surface of the grade to a smoothness of ±3/4 inch per 10 feet. With approval of the Engineer, the specified smoothness may be obtained by the placement of a thin layer of granular material, Class II. Ensure where necessary to place more than one layer of insulation board, the joints are staggered. Ensure backfill and compaction equipment is approved by the Engineer.

B. Asphalt or other material having a temperature exceeding 150 °F must not be placed in direct contact with the insulation board.

17. Final Restoration. Ensure final grade is 5 feet above completed water main or water service line, unless otherwise approved by the Engineer.

18. As-Built Plans. In addition to MDOT requirements, prepare and provide as-constructed plans within 2 weeks of water main completion, including AutoCAD(dwg), shapefile, excel or CSV file(s) with coordinates of valves, valve boxes, fittings, hydrants, taps, curb stops and water main pipe (at 60 foot intervals). Use the Michigan State Plane South Coordinate System and ensure grid to ground scale is noted. Ensure accuracy is sub-foot.

**e. Measurement and Payment.** The completed work, as described, will be measured and paid for at the contract unit price in accordance with subsection 823.04 of the Standard Specifications for Construction except as otherwise shown below and using the following pay items:

**Pay Item Pay Unit**

Water Main, DI \_\_ inch, Tr Det G, Modified Foot

Water Main, Valve Box Each

Water Main, Butterfly Valve, Installation, \_\_ inch Each

Gate Valve and Box, \_\_ inch, Modified Each

Water Main, Insertion Valve, \_\_ inch Each

Insulation Board, 2 inch Square Foot

Connect to Existing Main, \_\_ inch Each

Fire Hydrant, Modified Each

Water Serv, \_\_ inch Each

1. **Water Main, DI \_\_ inch, Tr Det \_\_, Modified** will be measured and paid for in accordance with section 823 of the Standard Specifications for Construction based on the sizes and trench details required, along the centerline of the pipe. The unit price of Water Main, DI, includes the cost of removing or abandoning existing water mains, gate valve boxes, and other appurtenances to provide clearance for the proposed water main or roadway.

2. **Water Main, Valve Box** includes all labor, materials, and equipment necessary to perform the installation, as required by this special provision and section 823 of the Standard Specifications for Construction.

3. **Water Main, Butterfly Valve, Installation, \_\_ inch** includes all labor, materials, and equipment necessary to perform the installation, as required by this special provision and section 823 of the Standard Specifications for Construction.

4. **Gate Valve and Box, \_\_ inch, Modified** includes the cost of installing the valve of size required and valve box, complete and ready for use. Contractor must provide concrete bricks for valve box foundation/support.

5. **Water Main, Insertion Valve, \_\_ inch** will be measured and paid for at the contract unit price for furnishing all material, labor and equipment necessary to perform the installation and operation of the insertion valve including the valve vaults for Insta-Valves as required by this special provision.

6. **Insulation Board, 2 inch** includes furnishing and installing the insulation board complete including fasteners and any required granular material, Class II. Also, includes hand digging to verify the location and elevation of the water main or service line.

7. **Connect to Existing Main, \_\_ inch** will include furnishing and installing any fitting, sleeves and mechanical joints required to connect the proposed main to the existing main. It also includes any excavation, dewatering, backfill, compaction and testing required to complete work as described herein.

8. **Fire Hydrant, Modified** includes the cost of installing the hydrant, hydrant valve, valve box, hydrant lead pipe and all fittings between the water main and hydrant. As well as installing contractor provided hydrant extensions, drain plugs, drain bushings, 0.5 cubic yard crushed stone for drainage, and hydrant signs with post where required and as directed by the City or Engineer.

9. **Water Serv, \_\_ inch** will be paid for each water service of the diameter specified and installed on the proposed water main and reconnected to the existing service. The item will include earth excavation; jacking and boring; tapping the main; providing and installing the service saddle, corporation stop, copper, curb stop, curb box, and any other required fittings; connecting the proposed street service to the existing service with the new curb stop and box; disinfecting; providing, placing, and compacting backfill and any other miscellaneous materials, equipment and work necessary for the installation of the service connection of the diameter specified from the proposed water main to the existing curb stop. Complete removal of the existing curb box will also be included.