

**SPECIFICATIONS
FOR
WATER MAIN AND APPURTENANCES
CITY OF MAPLE GROVE, MINNESOTA**

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1) GENERAL

The General Specifications and the Special Provisions and Conditions as embodied in these Contract Documents shall be applied to all work and materials to be furnished and installed under these specifications.

Contractor shall submit all product and installation literature to the Engineer for approval at the Preconstruction Conference.

2) LOCATION

The Water Main and appurtenances to be constructed and installed under this contract are located in the City of Maple Grove, Hennepin County, Minnesota, as shown on the drawings.

3) SCOPE OF WORK

This work shall consist of providing all labor, equipment and materials to construct the water main pipes and appurtenances. All pipe, fittings and appurtenances shall be furnished and installed in place, connected, tested, and sterilized. All work and materials shall be in accordance with all pertinent requirements of the Minnesota Pollution Control Agency and Minnesota Department of Health for the conveyance of potable water, the latest requirements of the Federal Safe Drinking Water Act, and shall be ready for full operation before final payment will be made. The Contractor shall excavate the trenches and pits to the required dimensions; sheet, brace and support the adjoining ground or structures where necessary; handle all drainage or ground water; provide barricades, guards and warning lights; lay and test the pipe, fittings, valves, hydrants and accessories; backfill and consolidate the trenches and pits; maintain the surface over the trench, remove surplus excavated material; and clean the site of the work.

The Contractor shall furnish all equipment, tools, labor and materials required to rearrange sewers, conduits, ducts, pipes or other structures encountered in the installation of the work. All the work to completely

construct the water facilities shall be done in strict accordance with these Specifications.

4) METHOD OF PROCEDURE

The Contractor shall perform work in such a manner as to cause the least interference and delay to such other work as may be in progress at the time by other Contractors. The Contractor shall notify the Engineer in writing of his/her intentions to commence work at least five (5) days prior to moving onto the site.

Prior to the start of any work, the Contractor shall submit in writing to the Engineer a schedule of procedure and shop drawing submittals.

The Contractor shall notify the Owner and the affected property owners before shutting off water mains. The Contractor must plan his/her operation to cause the least amount of disruption of water service in the affected area.

The Contractor shall be responsible for the operation of all existing and new gate valves required for the installation of water main and other appurtenances. The Owner and or on-site inspection staff must be present during the operation of all valves. If Contractor fails to have appropriate staff present or by negligent acts a gate valve mal-functions, it is the Contractor's responsibility to remedy the situation to the satisfaction of the Owner. If the Contractor fails to take appropriate action, the Owner shall have the corrections made and assess \$500.00 for damages plus costs incurred.

5) MATERIALS

All materials required for this work shall be new material conforming to requirements of the reference specifications for the class, kind, type, size, grade, and other details indicated in the Contract. The Contractor shall submit in writing a list of materials to be furnished showing the manufacturer and designation of all items, said list to be approved by the Engineer prior to installation.

a. POLYVINYL CHLORIDE (PVC) PRESSURE PIPE

i. PVC Pipe

Polyvinyl chloride pressure pipe (PVC) for water main shall conform to AWWA C 900 for pipe sizes 4" to 12". All pipes shall have a minimum dimension ratio (DR) of 18 corresponding to a maximum working pressure of 235 PSI for PVC. Polyvinyl chloride pressure pipe (PVC) for water main shall conform to AWWA C 905 for pipe sizes 14" to 48". All pipe shall have a minimum dimension ratio (DR) of 25 corresponding to a pressure class of 165 PSI for PVC. The PVC compound shall be D1784. Laying length shall be 20 feet (+/- 1") for all sizes.

ii. JOINTS

The bell shall consist of an integral wall section with a factory-installed, solid cross section elastomeric ring which meets the requirements of ASTM F-477. The bell section shall be designed to be at least as hydrostatically strong as the pipe wall and meet the requirements of AWWA C 900 for sizes 4" to 12" and AWWA C 905 for sizes 14" to 24". All slip joints and plugs shall be slip rodded.

b. DUCTILE IRON WATER PIPE AND FITTINGS

i. DUCTILE IRON PIPE

Ductile iron pipe shall be made in accordance with ANSI Specification A21.51 (AWWA C151).

All pipe joints shall be an approved slip type joint with rubber gasket, or mechanical joint. Mechanical joint pipe shall comply with ANSI Specification A21.11. Slip joint gaskets shall be molded rubber rings made expressly for the joint used. Mechanical joint gaskets shall be made from vulcanized crude rubber compound. All surfaces shall be smooth, free from imperfections and free from porosity. Electrical conductivity for slip joint pipe must be provided by a metal cable or strap, capable of withstanding 600 amperes of current, fastened across the pipe joint.

Every pipe and fitting shall be cement lined on the inside. Cement mortar lining for ductile iron pipe and fittings shall be in conformance with ANSI Specification A21.4, except that the lining shall be half thickness (Standard Enameling). The pipes exterior shall have a bituminous seal coating at least one mil thick. It shall adhere tenaciously to the cement mortar and pipe. Spotty or thin coating, or poor adhesion, shall be cause for rejection of the pipe.

ii. DUCTILE IRON FITTINGS

Ductile iron fittings shall be Tyler, Mueller or approved equal by the engineer. Class 350 for sizes up to and including twelve inches (12") diameter and shall conform to ANSI Specification A21.53 (AWWA C153) covering short body fittings and shall be mechanical joint. Ductile iron fittings over twelve inches (12") in diameter shall comply with the above specifications and shall be Class 150.

Stainless Steel 316 grade or Cor-Blue T-bolts shall be used on all mechanical joints. No other type of bolts shall be allowed unless approved by the Engineer. Restraints fittings shall be coated with fusion bonded epoxy coating to the required requirements of ANSI/AWWA C116/A21.16, and shall be Star Mega Lug or approved equal. Stainless Steel bolts shall be tightened by hand only. All bolts shall be torqued as per manufactures' specifications.

c. RESILIENT WEDGE GATE VALVE

Valves 2"-10" shall be resilient wedge type rated for 250 p.s.i.g. cold water working pressure. All ferrous components shall be ductile iron, ASTM A536.

The wedge shall be ductile iron or bronze encapsulated with EPDM rubber and provided with male type guides and polymer guide covers.

Bolting shall be Type 316 stainless steel and shall be provided with hexagonal heads with dimensions conforming to ANSI B18.2.1. Metric size, socket head cap screws therefore are not allowed.

Operating nut shall be constructed of ductile iron and shall have four flats at stem connection to assure even input torque to the stem.

All gaskets shall be pressure energized O-rings.

Stem shall be sealed by three O-rings. The top two O-rings shall be replaceable with valve fully open and while subject to full rated working pressure. O-rings set in a cartridge shall not be allowed.

Valve shall have thrust washers located with one (1) above and one (1) below the thrust collar to assure trouble-free operation of the valve.

All internal and external surfaces of the valve body and bonnet shall have a fusion-bonded epoxy coating, complying with ANSI/AWWA C550, applied electrostatically prior to assembly.

Valves shall be certified to ANSI/NSF Standard 61-G or Standard 372.

American Flow Control Series 2500 Resilient Wedge Gate Valves with Alpha Ends shall be an acceptable alternative.

d. BUTTERFLY VALVE

Butterfly valves and boxes shall conform and be in accordance with AWWA C504. Butterfly valves shall be American Flow Control, Kennedy, Mueller, Pratt "Ground Hog", DeZurik ACCWRT or Owner approved alternative and shall be suitable for a working pressure of 1030 Kpa (150 psi).

All valves shall have openings through the body of the same circular area as that of the pipe to which they are attached.

Valves shall be provided with a two inch (2") square operating nut and shall open in a counter-clockwise direction. Bolts for butterfly valve shall be 316 SS, epoxy coated.

e. VALVE BOXES

Valve boxes shall be cast or ductile iron of the three piece type suitable for a depth of 7-1/2 feet of cover over the top of the pipe or to a depth as shown on the plans. Shafts shall be 5-1/4 " diameter, bases may be round or oval and length adjustment shall be screw type. Valve boxes shall be Tyler 6860 G, Sigma VB 261-268, or Star Pipe Products, or owner approved alternate with base and size shown below:

Pipe Size	Depth to Top of Pipe	Box	Base
6 inches	7.5 feet	"G"	No. 6
8 inches	7.5 feet	"G"	No. 6

Drop covers on valve boxes shall bear the word "water" on the top and be Tyler 6860 G, Sigma VB 2600 "Stayput" covers with extended skirt or Star VB-5014, or Owner approved alternate. Use valve box extensions that screw on the outside of valve box if valve box needs an extension. No inside extensions will be allowed.

f. HYDRANTS

Hydrants shall be Waterous Pacer, and be in accordance with the standard AWWA Specification C502, latest revision, for hydrants. Supply the hydrants with a 16" upper stand pipe length.

Hydrants are to have a five inch (5") minimum valve opening. Equip with two 4-1/2" pumper connections. The 4-1/2" pumper connections shall have 4 threads per inch. (Minneapolis Thread)

Hydrants shall open to the left (counterclockwise) and be marked with an arrow to show the direction of opening. Mark the hydrant with the name of the manufacturer and the year installed on the project. Bolts for hydrants shall be 316 SS, epoxy coated.

Fire hydrants with Alpha Restrained Joint Ends are acceptable.

g. WATER SERVICE

1", 1½", and 2" water services shall be PE-4710 (blue with clear core) SDR 7 PE pipe. All services shall terminate 9' into the property unless otherwise noted. See section 5i for compression fittings specifications at PE water service connections.

h. FITTING RESTRAINTS & PIPE JOINT RESTRAINTS

Fittings restraints shall be designed for use on PVC pipe conforming to AWWA C 900 & C 905. Incorporate joint restraint in the design of the follower gland and include a restraining mechanism which, when actuated, imparts multiple wedging action against the pipe, increasing its resistance as the pressure increases. Maintain flexibility

of the joint after burial. Manufacture glands of ductile iron conforming to ASTM A536-65.

Use twist-off nuts, sized same as tee-head bolts, to ensure proper actuating of restraining devices. The mechanical joint restraint device shall have a working pressure of at least 250 psi with a minimum safety factor of 2:1 and be EBAA Iron, Inc. Restraints fittings shall be coated with fusion bonded epoxy coating to the required requirements of ANSI/AWWA C116/A21.16.

i. COMPRESSION FITTINGS

Compression fittings shall be manufactured in compliance with ANSI/AWWA C800.

Brass components that come in contact with potable water shall conform to AWWA Standard C800 (ASTM B584, UNS C89833), and identified with "NL" for lead free identification. Brass components that do not come in contact with potable water shall conform to AWWA Standard C800 (ASTM B62 and ASTM B584, UNS C83600, 85-5-5)

Stiffeners shall be required on all flexible plastic connections.

j. ELECTROFUSION FITTINGS

Electrofusion fittings shall be manufactured in compliance with ASTM F-1055 and tested in compliance with ASTM-D2513 and AWWA C906. Resin is PE 3408 virgin material that complies with ASTM D1248: ASTM D3350. The resins have a NSF Standard 14 listing and a PPI rating. Electrofusion fitting shall be pressure rated for maximum operating pressure of 165 PSI. The fitting shall be manufactured with an integral identification resistor, which automatically sets the fusion time on the Electrofusion Processor.

k. SERVICE SADDLES

- i. Service Saddles are required for taps made on PVC Water main. The saddles shall be Smith-Blair 372. Service taps shall be made a minimum of 3 feet apart as measured from the tap location. Saddles shall be a full faced gasket.

l. CORPORATION STOPS

Corporation stops shall be;

- i. FORD
 - ii. 1" = FB1001-4-NL (for PE-4710 applications), 1 ½" = FB 600-6-NL, 2" = FB 600-7-NL
- ii. McDONALD
 - ii. McDonald 74701B-33
- iii. MUELLER
 - ii. Mueller B-25000-N

Corporations shall be SIDR 7 PE pack joint.

m. TAPPING SLEEVES (WET TAPS)

All tapping Sleeves shall be Smith-Blair Model No. 662. The tapping sleeve body shall be a full circumference band, 18-8 type 316 stainless steel. The flange shall be in accordance with specifications of AWWA C207 Class D, and shall conform and meet ANSI 1030 Kpa (150 psi) drilling with an epoxy coated finish. The Gasket shall be Grade 60 concave wedge steel. The bolts, nuts, and washers shall be 18-8 type 316 stainless steel. Nuts and studs shall be coated to prevent galling.

n. CURB STOPS

Curb stop shall be;

- i. FORD
 - ii. 1" X 1" = B 22-444-M-NL with 1" Pack joint coupling 1" X 1" = C06-44-NL (for PE – 4710 applications)
 - iii. 1 ½" X 1 ½" = B 22-666-M-NL,
 - iv. 2" X 2" = B 22-777-M-NL

ii. MCDONALD

- ii. 76104 with 1" NL Service Fitting 1" X 1" = 74755-33 (for PE -4710 applications)

iii. MUELLER

- ii. B-25154-N

Curb stops shall be a flared curb stop with pack joint adapter on the main side.

o. STOP BOXES

The stop box shall be an extension type with stationary rod – Minneapolis pattern base and a 1" upper section, 12" adjustment with an 8-foot length when fully extended.

Stop Boxes shall be:

i. 1" SERVICES

- ii. FORD - EM2-8046-78-R WITH PS LID
- iii. MUELLER – H-10332 SERIES WITH 89376 LID
- iv. MCDONALD – 5610 WITH 5604L LID

ii. 1-1/2" AND 2" SERVICES

- ii. FORD – EM2-80-47-78-R WITH PS LID
- iii. MUELLER – H-10332 SERIES WITH 89376 LID
- iv. MCDONALD – 5611 WITH 5607L LID

p. TRACER WIRE

A tracer wire shall be laid with all pipes.

For all trench installations tracer wire shall be direct burial #12 AWG Solid (0.0808" diameter), 21% conductivity copper-clad hard drawn high carbon steel extra high strength horizontal tracer wire, 452 pound average tensile break load, 45mil. The conductor insulator

shall consist of a high molecular weight-high density blue polyethylene jacket complying with ASTM-D-1248, 30 volt rating.

Termination of the tracer wire shall be connected to all metal fittings including but not limited to; gate valves, curb stops and fire hydrants. The tracer wire shall be incidental to pipe installation. The terminations shall be a 1" cast brass ground clamp to be on curb stops just below the cap on the standpipe and shall be installed 4" – 6" below finish grade elevation. Terminations at fire hydrants shall include installation of a junction box for around termination for ease of access. This work shall be considered incidental.

Tracer wire shall be securely affixed to the top exterior surface of the pipe using PVC pipe tape at 5-foot intervals. Tracer wire shall be looped around valves, saddles, curb stops, and other appurtenances in such a manner that there is no interference with the operation of the appurtenances. No tracer wire shall run up valve boxes. Tracer wire shall be continuous and without splices, breaks, or cuts except for spliced-in connections as approved by the Engineer. Where approved spliced-in connections occur, 3M DBR watertight connectors, or owner approved alternative, shall be used to provide electrical continuity.

DryConn Waterproof Direct Bury Lugs as manufactured by King Innovation shall be used to splice into the main line tracer wire. The main line tracer wire shall not be broken or cut.

For pipe bursting or horizontal directional drill operations, it shall be water blocking #19 AWG solid copper conductor and tin plated with Kevlar strength water blocking yarns with minimum breaking strength of 1,800 pounds, Kevlar braid, polyethylene jacket and inner and outer HDPE jacket. Product shall be Trace Safe® or Owner approved alternative.

q. HIGH DENSITY EXTRA-HIGH MOLECULAR WEIGHT POLYETHYLENE (HDPE) PIPE

i. MANUFACTURER

All HDPE pipe and fittings shall conform to ASTM D3350, D3035, ASTM F714 and AWWA C906

Both pipe and fittings shall carry the same pressure rating. All fittings shall be pressure rated to match or exceed the system piping to which they are joined.

ii. FITTINGS

The standard HDPE fittings shall be standard commercial products manufactured by injection molding or by extrusion and machining, or, shall be fabricated from PE pipe conforming to this specification. The fittings shall be fully pressure rated by the manufacturer to provide a working pressure equal to the pipe for 50 years' service at 73.4°F with an included 2:1 safety factor. The fittings shall be manufactured from the same resin type, grade, and cell classification as the pipe itself. The manufacture of the fittings shall be in accordance with good commercial practice to provide fittings homogeneous throughout and free from crack, holes, foreign inclusions, voids, or other injurious defects. The minimum "quick-burst" strength of the fittings shall not be less than that of the pipe with which the fitting is to be used. Fittings will be listed for each size and type of fitting on proposal.

iii. JOINING

The fusion equipment and operator shall be certified by the pipe manufacturer. Sections of polyethylene pipe should be joined by butt fusion or Electrofusion fittings and shall be performed in strict accordance with the pipe manufacturer's recommendations. The butt fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements of 400°F, alignment, and 75 psi interfacial fusion pressure.

iv. MECHANICAL JOINT CONNECTION WITH HDPE PIPE

Connection to valves, hydrants, etc. will require mechanical joint transition fittings from HDPE to DIP or PVC.

Mechanical joint transition fittings shall be considered incidental to the pipe.

v. HDPE PIPE MARKING

During extrusion production, the HDPE pipe shall be continuously marked with durable printing following ASTM and AWWA standards

r. AIR RELIEF MANHOLE CASTING

The standard manhole casting shall be Neenah Foundry No. R-1723. The minimum allowable weight shall be 350 pounds.

6) HANDLING OF WATER MAIN AND APPARATUS

The manufacturer shall package the pipe in a manner designed to deliver the pipe to the project neatly, intact, and without physical damage. The transportation carrier shall use appropriate method and intermittent checks to insure the pipe is properly supported, stacked, and restrained during transport such that the pipe is not nicked, gouged, or physically damaged.

Pipe shall be stored on clean, level ground to prevent undue scratching or gouging of the pipe. If the pipe must be stacked for storage, such stacking shall be done in accordance with the pipe manufacturer's recommendations. The handling of the pipe shall be done in such a manner that it is not damaged by dragging over sharp objects or cut by chokers or lifting equipment.

Sections of pipe having been discovered with cuts or gouges in excess of 10% of the wall thickness of the pipe shall be cut out and removed. The undamaged portions of the pipe shall be rejoined using the butt fusion joining method.

Fused segments of pipe shall be handled so as to avoid damage to the pipe. When lifting fused sections of pipe, chains or cable type chokers must be avoided. Nylon slings are preferred. Spreader bars are recommended when lifting long fused sections. Care must be exercised to avoid cutting or gouging the pipe.

The Contractor shall be responsible for material furnished. Any materials that are found defective in manufacture or that have become damaged in handling after delivery by the manufacturer shall be replaced at Contractor's expense. This shall include the furnishing of material and labor required for the replacement of installed material discovered defective prior to the final acceptance of the work, or during the warranty period of the work.

The Contractor shall be responsible for the safe storage of material furnished and accepted by him, and intended for the work, until it has been incorporated in the completed project. The interior of pipe, fittings, and other accessories shall be free from dirt and foreign matter at all times. Drain and store valves and hydrants in a manner that will protect them from damage and freezing.

7) LAYING OF PIPE AND FITTINGS

Water main materials shall be carefully lowered into the trench by suitable tools or equipment in such a manner as to prevent damage to materials and protective coatings and lining. Under no circumstances shall water main materials be dumped into the trench.

All foreign matter or dirt shall be removed from the inside of the pipe and fittings before it is lowered into its position in the trench, and shall be kept clean by approved means during and after laying. In the suspension of work at any time, suitable stoppers shall be placed to prevent earth or other substances from entering the main.

Water mains shall be laid at least ten feet (10') horizontally from any sanitary sewer, storm sewer, or sewer manhole, whenever possible. When local conditions prevent a horizontal separation of ten feet (10'), a water main may be laid closer to a storm or sanitary sewer provided that the bottom of the water main is at least eighteen (18) inches above the top of the sewer.

Water mains crossing house sewers, storm sewers, or sanitary sewers shall be laid to provide a separation of at least 18 inches between the bottom of the water main and the top of the sewer. When local conditions prevent a vertical separation as described, the following construction shall be used:

- i. Sewers passing over water mains or less than 18 inches below water mains shall be constructed of materials equal to water main standards of construction.

In addition, sewers passing over water mains shall be protected by providing:

- i. A vertical separation of at least 18 inches between the bottom of the sewer and the top of the water main.
- ii. Adequate structural support for the sewers to prevent excessive deflection of joints and settling on and breaking the water mains.

- iii. That the length of water pipe be centered at the point of crossing so that the joints will be equidistant and as far as possible from the sewer.

Every pipe shall be bedded uniformly throughout its entire length as per bedding requirements.

No pipe shall be laid in water or when the trench conditions are unsuitable for such work. Refer to the General Conditions for rock placement in a wet trench.

Concrete blocking is required behind all bends over 12 degrees. Manhole blocks may be used for blocking on bends that are under 12" diameter. Sizes 12" and above would require poured-in-place concrete. For dead-end stubs or service stubs, the slip joints must be rodded at the joint using retainer glands and rods. These requirements are in addition to the EBAA Iron, Inc. See Maple Grove Standard Plate WM-10 for more details.

8) JOINTING OF PIPE AND FITTINGS

Complete jointing of mechanical joint pipe, push-on joint pipe, and fittings in accordance with AWWA Section 9b and 9c of AWWA Specification C600 latest revision.

When pipes are cut in the field, the cut or straight end shall have sharp or rough edges removed before assembly.

For approved slip-on joints, the jointing shall be done strictly in accordance with approved methods. Proper assembly tools shall be used.

Both the spigot and socket must be thoroughly clean, free from tar or other coatings and rust.

For mechanical joint pipe, the last eight inches (8") outside the spigot end of the pipe and the inside of the bell, fittings, and gate valves shall be thoroughly cleaned to remove oil, grit, tar (other than standard coating) and other foreign matter from the joint and then painted with a standard solution furnished by pipe manufacturer.

After the spigot end of a pipe is placed into the bell and pulled home, the gasket shall be pressed into place within the bell evenly around the entire

joint. After the gland is positioned behind the gasket, the Contractor shall install all bolts and nuts and tighten them with a torque wrench. Nuts spaced 180 degrees apart shall be tightened alternately to produce equal pressure on all parts of glands.

Jointing shall be done, unless specifically excepted above, in accordance with "Notes on Method of Installation" included in ANSI Specification A.21.11 for a mechanical joint for pressure pipe and fittings.

When pipes are cut in the field, or when slip-on joints are joined to mechanical joint spigots, or spigots with straight ends, the cut or straight end shall be beveled and all sharp or rough edges shall be removed. EBAA Iron, Inc. Megalugs or approved equal shall be used for jointing pipes and fittings.

Butt fusion joining shall be 100% efficient offering a joint weld strength equal to or greater than the tensile strength of the pipe. Socket fusion shall not be used, except for services. Extrusion welding or hot gas welding of HDPE shall not be used for pressure pipe applications nor in fabrications where shear or structural strength is important. Flanges, unions, grooved-couplers, transition fittings and some mechanical couplers may be used to mechanically connect HDPE pipe without butt fusion. Refer to the manufacturer's recommendations.

Pipes installed inside a casing shall require joint restraints. Restraints shall be install so as to resist both tension and compression (push or pull) forces. Megalugs with rods will require rods to be double nutted with one each on either side of the restraint.

Fused C900 is not acceptable

9) SETTING HYDRANTS

Hydrants shall be placed where shown on the plans or where directed by the Engineer.

Hydrants shall be supported upon a concrete base minimum of eight inches (8") thick. Each hydrant shall be braced against undisturbed ground by an eight inch (8") thrust block. Hydrants shall be rod tied back to the main line using 5/8" minimum sized tie rods with a non-corrosive coating. All joints must be restrained between hydrant and mainline tee. Only EBAA Iron, Inc. Megalugs are allowed in lieu of tie rods for joint restraint.

Hydrants of sufficient length shall be installed as to provide a minimum of seven and one half feet (7 ½') of ground cover over the top of the lead pipe and the lowest outlet nozzle on the hydrant shall be not less than twenty-one inches (21") nor more than twenty four inches (24") above the ground line.

The Contractor shall obtain proper adjustments using ductile iron pipes, water main fittings, short vertical depth type hydrants, or other methods as pre-approved by the Engineer. All material and fittings used to attain proper elevation will be considered incidental.

A drainage pit two feet (2') in diameter and three feet (3') deep shall be excavated below each hydrant base and filled compactly with coarse gravel or crushed stone and coarse sand, under and around the elbow and concrete base to a level of six inches (6") above the waste opening.

Cover all material placed for drainage with a minimum of two layers of four (4) mil polyethylene.

Hydrants must maintain their position and must not be displaced out of plumb during backfilling. Any hydrant out of plumb shall be excavated, reset, (including blocking) and re-backfilled. This work shall be incidental to the hydrant.

10) SETTING VALVES

Valve boxes shall be firmly supported to maintain a centered and plumb alignment over the wrench nut of the gate valve, with box cover flush with the surface of the finished pavement or at such other level as may be directed by the Engineer.

Valve boxes shall be set to the top of the bituminous base or binder course, as appropriate, when installed. The valve boxes shall be adjusted prior to placement of the bituminous wear course and shall be paid for under Item "Adjust Valve Box" at the Contract unit price per each.

11) REACTION BLOCKS

All plugs, caps, tees and bends deflecting more than 12 degrees shall be provided with reaction blocks. Concrete, suitable metal rods or harness, which are rust-proofed and/or retainer glands may be used subject to the

Engineer's approval. Reaction blocking shall be so placed that all pipe and fitting joints are accessible for repair, and in such a manner as to provide bearing against undisturbed ground.

Testing of lines shall not proceed until concrete thrust blocks have attained their design strength. See Maple Grove Standard Plate WM-11 for more details.

12) POLYSTYRENE INSULATION

This work shall consist of furnishing and installing insulation board above the water main and sewer pipe at the locations designated in the Drawings. This work shall be performed in accordance with the details, the applicable MnDOT Standard Specifications, and the following:

The insulation board shall be rigid expanded polystyrene conforming to the material requirements of MnDOT 3760. Styrofoam S.M. and Styrofoam TG brand insulation is an approved insulation material.

The insulation material shall be furnished in panels 2 inches thick and shall be placed on a smooth level foundation in a staggered manner that will provide joint overlaps a minimum of 6 inches on the underlying sheets and the edges shall be trim and square.

The placement of the backfill material over the insulation board and compaction thereof shall be accomplished in a manner that will preclude damage to the insulation material. Construction equipment of any kind shall not operate directly on the insulation board. Sections of insulation board damaged by the Contractor's construction operations shall be replaced at the Contractor's expense. See Maple Grove Standard Plate wm-12 for required size and thickness of Polystyrene Insulation.

13) HOUSE SERVICES

It shall be the duty of the Contractor to cooperate with the Owner to keep accurate records of service connections as to location, depth to top of connection, size of connection provided and other pertinent data. Tap location shall be made in respect to the nearest manhole or hydrant from the service. Curb stops shall be located as shown on the drawings and the position located with ties to houses or other existing structures. All service fitting shall have a GPS shot of their location done by the Contractor within the tolerance of .33' (feet). Refer to Quality Service Locate Section 18 of the General Specifications for details. Water services shall be located at least three feet (3'), measured horizontally, away from sanitary sewer

services on the upstream side and for the most convenience to the benefited property.

The Contractor shall make all taps into the water main at an angle of 22.5 degrees from horizontal and install corporation stops.

The SDR 11 IPS PE service lines between the water main and the curb boxes shall have a minimum of 7.5 feet of cover except at the goose neck which shall have 6-1/2 feet minimum cover and place as a continuous line. Service lines must be placed beneath obstructions which would prohibit the required cover if the service line was placed on top of obstruction. The method of tunneling under an obstruction shall be approved by the Engineer and incidental to the project.

Contractor shall mark each curb box with a 4' long, 2" x 2" wooden post, extending to a point two feet (2') above the ground.

When using 4" or larger pipe for a service line, retain the last two (2) uncut lengths of pipe and the plug by use of a bell clamp and use only EBAA Iron, Inc. Megalugs or other method approved by the Engineer. A 10-foot horizontal separation is needed between 4" or larger water service and the sanitary sewer service.

No water service shall be installed within ten feet (10') horizontally from a manhole. Water service piping, no matter the size, shall be installed in one continuous piece without intermediate joint couplings between the corporation and the curb stop box.

14) HORIZONTAL DIRECTIONAL DRILL (HDD)

Cert-Lok, or High-density, extra-high molecular weight polyethylene (HDPE EHMW) pipe shall be used for the HDD installations as specified on the Drawings or as approved by the Engineer.

All piping system components shall be the products of one manufacturer.

The pipe shall have a minimum SDR (Standard Dimension Ratio) wall thickness, nominal size and pressure rating as specified on the Drawings.

A minimum of two (2) tracer wire lines shall be drilled with the pipe.

Pipe and fittings may be rejected for failure to meet any of the requirements of these specifications. No compensation will be given the Contractor for rejected materials.

The Contractor shall be responsible for pipe refusal, lost heads, mud loss, heaving of surface features, etc. that may result from the operation of directional drilling. The means and methods for rectifying the drilling concerns shall be incidental and approved by the Engineer.

15) WATER SERVICE DISRUPTION

a. GENERAL

The Contractor must plan their operation to cause the least amount of disruption of water service in the affected area. The Contractor shall notify the Engineer and Owner a minimum of two (2) working days prior to shutting off the water main. The Owner will supply a letter for the Contractor to distribute to all affected properties. Property owners must be given a minimum of 24 hours' notice prior to shutting off the water main. All hydrants shall be plumb and all curb stop boxes shall be to grade, plumb and concentric about the operating nut after relocation.

16) ADJUST CURB STOP STAND PIPE AND WATER VALVE BOXES

a. GENERAL

The Contractor is responsible for the protection of all underground utilities which are located in the field or are shown on the plans, and shall adjust all water valve boxes and curb stop boxes which require such adjustment. After adjustment, all valve boxes shall be ¼" to ½" below finished grade and shall be in proper working order. Asphalt used to adjust manholes is incidental to the adjustment. All curb stop boxes and valve boxes shall be plumb and concentric about the operating nut after adjustment.

b. ADJUST CURB STOP STAND PIPE

This work shall consist of adjusting the standpipe to 1" below finished sod line. If the existing standpipe cannot be adjusted to the proper elevation, then the top of the pipe shall be cut and re-threaded or the setscrew type of top may be used. All interim adjustments are considered incidental.

17) TESTING AND DISINFECTING MAIN

The Contractor shall notify the Engineer and the City Utility Department 24 hours prior to testing of utilities. The Engineer or a representative from the City Utility Department must witness all utility testing.

a. HYDROSTATIC TESTING OF WATER MAINS

After the pipe has been installed and backfilled it shall be subjected to hydrostatic pressure of 150 pounds per square inch. The duration of each such test shall be at least two (2) hours. No water will be allowed to be added to the water main during water main pressure testing. Any pipe greater than 16" the pressure test needs to be approved by the Owner prior to hydrostatic test. The allowable pressure drop shall not exceed two (2) PSI in either hour or three (3) PSI in the two (2) hour period.

Each section of pipe shall be slowly filled with water and the specified test pressure, measured at the lowest point of elevation, shall be applied by means of a pump connected to the pipe in a satisfactory manner. The pump, pipe connection, gauges and all necessary apparatuses shall be furnished by the Contractor. Gauges and measuring devices must meet with the approval of the Engineer and the necessary pipe taps made as directed. Before applying the specified test pressure, all air shall be expelled from the pipe. To accomplish this, taps shall be made, if necessary, at points at highest elevations, and afterward tightly plugged. All taps made for testing shall be at the Contractor's expense.

The test gauge shall be certified accurate by accredited testing agency within one year from date of test to be performed. The dial shall register from 0 to 200 PSI and shall be minimum four and one half inch (4-1/2") diameter; readings marked in minimum one pound increments and have a mirrored band on the dial face using a knife-edge pointer accurate to $\pm 0.25\%$ over full scale.

The contractor shall insure that the water main installed meets the pressure test. The contractor may test against an existing valve. However if an existing gate valve does not hold pressure the Contractor shall install either a temporary gate valve or a plug to test against.

The installation of such temporary fittings and sleeves on the main after the test will be at the Contractor's expense.

b. DISINFECTING WATER MAIN

Disinfect the new pipe, valves and fittings as described in AWWA Specification No. C651, by use of the tablet or granule method which is described as follows:

Place hypochlorite tablets in each section of pipe and also in hydrants, hydrant branches and other appurtenances during construction.

Placing of calcium hypochlorite granules. During construction, calcium hypochlorite granules shall be placed at the upstream end of the first section of pipe, at the upstream end of each branch main, and at 500-ft intervals. The quantity of granules shall be as shown in Table 1.

WARNING: This procedure must not be used on solvent-welded plastic or on screwed-joint steel pipe because of the danger of fire or explosion from the reaction of the joint compounds with the calcium hypochlorite.

Table 1 Ounces of calcium hypochlorite granules to be placed at beginning of main and at each 500-ft interval

Pipe Diameter (d)		Calcium Hypochlorite Granules	
Inch	Millimeter	Ounces	Grams
4	100	1.7	57
6	150	3.8	113
8	200	6.7	200
10	250	10.5	300
12	300	15.1	430
14 and larger	350 and larger	$D^2 \times 15.1$	$D^2 \times 427.9$

Where D is the inside pipe diameter in feet $D = d/12$

The number of tablets required per 20 foot length of pipe based on 3-3/4 grain available chlorine per tablet is as follows:

Diameter	No. of tablets
4"	1
6"	2
8"	3

10"	4
12"	5
16"	9
18"	12
20"	14
24"	20

Tests are required to determine chlorine residual at the end of the 24 hour retention period and after flushing to ascertain that heavily chlorinated water has been removed from the pipeline. At the end of the 24 hour retention period, the main shall contain not less than 0.5 ppm or not more than 1.0 ppm of free chlorine.

The City of Maple Grove shall test for bacteria and it shall meet Minnesota Health Department requirements. If the test fails to meet requirements, the Contractor shall re-chlorinate until requirements are met. Passing bacteria tests will be paid for by the Owner. Costs associated with failing bacterial tests will be charged to the Contractor.

c. ELECTRIC CONTINUITY TEST

A continuity test shall be performed by the Contractor on all tracer wire with the Engineer present to verify that the trace wire is continuous and allows for the proper tracing of the piping. If the trace wire is not continuous, to include all connection points between new and existing water mains, the Contractor, shall make necessary repairs/corrections. Continuity testing shall be conducted prior to paving roadways.

18) OPERATIONAL INSPECTION

At the completion of the project, and in the presence of the Engineer, the Contractor shall operate all valves, hydrants and water services to ascertain that the entire facility is in good working order. This includes verification that all valve boxes are centered and valves are opened. All hydrants operate and drain properly.

19) BACKFILLING

Backfill excavation in trenches shall be to the original ground surface or to grades as specified or shown on the plans. Begin the backfilling as soon as practicable after the pipe has been placed. Prior to backfilling, clean the excavation of trash, debris, organic material, and undesirable material. Trenches shall be backfilled every night prior to leaving job site. Trenches may be left open with appropriate protection with approval by the Engineer and Owner.

a. BACKFILL PROCEDURE AT THE PIPE ZONE

Backfill and compact as thoroughly as possible to prevent after settlement. Deposit the backfill so the shock of falling material will not damage the pipe or structures. Grade over and around parts of the work as directed by the Engineer.

Deposit suitable material determined by the Engineer, free from rocks and boulders, deposited in the trench simultaneously on both sides of the pipe for the width of the trench to a height above the top of the pipe as specified. Shovel place and hand tamp the pipe bedding material to fill spaces under and adjacent to the pipe. A jumping jack is required to be used along the length of the pipe on both sides. If natural, suitable, granular material is not encountered during the excavation of the trench, or when the material is determined unsuitable by the Engineer, for backfilling around the pipe as required above; provide and place approved material from other sources.

b. BACKFILL PROCEDURE ABOVE THE PIPE ZONE

Unless specified, furnish suitable backfill material and use the following backfill procedures above the "pipe zone" to the existing surface elevation or design grade, as specified

Backfill the trench to obtain compaction, with the lift thickness as required with a maximum of one foot (1') lifts. Compact the backfill material to 95% of the standard moisture density relationship of soils (ASTM D698-70) except the top three feet (3') of the trench which shall be compacted to 100% density.

Backfilling of utilities installed down lot lines shall require material to be compacted to 100 percent of the standard moisture density relationship of soils regardless of depth.

Consider settlements greater than one inch (1") measured with a string line from one edge of the settlement to the other within the warranty period of this contract failure of the mechanical compaction and repair street surfaces, driveways, and boulevard and ditch areas at no cost to the City.

c. DISPOSAL OF EXCESS MATERIALS AND DEBRIS

Unless specified, dispose of excavated material not suitable or not required for fill material within the project limits at the Contractor's expense. If the Engineer deems there is no area in the project limits to dispose of excess material, he shall direct the Contractor to dispose of material off site in a manner subject to the provisions of the following paragraph and the Contractor will be compensated in accordance with the bid unit price in the contract.

Before dumping materials or debris on a private or public land, the Contractor must obtain from the owner of land written permission for dumping and a waiver of claims against the owner for damage to land which may result together with permits required by law for dumping. File a copy of permission, waiver of claims and permit with the Engineer before disposal is made.

d. DENSITY TEST

Density tests will be performed by an approved soils testing firm at locations and depths throughout the project as directed by the Engineer. Cooperate and provide assistance as necessary to complete these tests with no additional compensation to the Contractor.

Testing costs pertaining to passing tests shall be paid for by the Owner. Testing costs pertaining to failing tests will be charged to and paid for by the Contractor.

20) SURFACE RESTORATION, CLEANUP AND

a. RESTORATION OF SURFACE

Return surfaces disturbed during the construction period to its original condition or better.

b. MAINTENANCE OF STREET UNTIL SURFACED

After backfilling according to the above specifications, maintain the streets as required and blade as necessary to provide a passable surface for traffic until the surfacing is completed or to the date of final acceptance.

c. CLEANING UP

Remove surplus pipe material, tools, and temporary structures and dirt or rubbish caused by Contractor's operations and haul excess earth from excavations to a dump provided by the Contractor, and leave the construction site in a condition satisfactory to the Engineer.

21) GUARANTEE

a. GUARANTEE

The Contractor shall be held responsible for defects in workmanship and materials which may be developed in part of the installation furnished by him and immediately replace upon written notice from the Engineer and make good, without expense to the owner, faulty part or parts and damage done during the period as prescribed in Section 7.8 of the conditions of the contract.

b. FAILURE TO REPLACE DEFECTIVE PARTS

Should the Contractor fail to make good the defective parts within a period of 30 days of written notification the Owner may replace these parts, charging the expense to the Contractor.

22) METHODS OF MEASUREMENT AND PAYMENT

a. WATER MAIN

Water main pipe will be paid for at the contract price per lineal foot for diameter of pipe furnished, including the cost of furnishing the pipe, rubber gasket, tracer wire, other material, delivering, handling, laying, trenching, granular bedding, backfilling, testing, disinfecting, and all other material or work necessary to install the pipe complete in place at the depth specified. The disposal of pipe spoils is considered incidental to the installation of water main.

b. WATER MAIN FITTINGS

Ductile iron, HDPE fittings, and specials will be paid for at the contract unit price per pound. Fitting restraints and bolts shall be considered incidental. Contractor shall provide material weight table for all specified fittings.

c. HYDRANTS

Hydrants will be paid for at the contract unit price per hydrant installed complete with drainage pit, gravel, concrete base, and bracing. The unit price for the hydrant does not include the auxiliary hydrant valve which shall be paid for under another item of these specifications, unless they are combined in bid proposal.

d. GATE VALVES AND BOXES

Gate valves and boxes (including covers and extensions) shall be paid for at the unit price bid for each size valve and box furnished and installed complete.

Valve boxes located within the street will need to be adjusted twice. Once after the base lift of bituminous and again prior to the bituminous wear course. The initial adjustment will be incidental. The final adjustment will be paid for at the bid unit price for adjust valve box. The initial adjustment must be completed within 10 days after the bituminous base course has been placed. If the Contractor does not complete the raising, adjusting, cleaning and patching of the gate valves, a \$500.00 per day penalty will be imposed on the Contractor until such work is done.

e. SIDR-7 PE WATER SERVICE PIPE

Water service pipe will be paid for at the contract unit price per lineal foot, for diameter of pipe furnished, measured from the corporation stop to the centerline of curb box. The unit price shall include pipe, miscellaneous items associated with the work including but not limited to the transition fittings, compression fittings, tracer wire and pipe bedding.

f. SERVICE TAP

Service taps will be paid for at the contract unit price for size furnished and installed and shall include corporation stop, stainless steel saddle, and tap for PVC water main installations.

Service taps on HDPE water main will be paid for at the contract unit price for size furnished and installed and shall include the tap, saddle socket, weld, corporation stop and other miscellaneous work for HDPE water main installations.

g. CURB STOPS AND BOXES

Curb stops and boxes will be paid for at the contract unit price for size furnished and installed and shall include curb stop, box, extension, brass clamps, termination of tracer wire, and lid.

h. POLYSTYRENE INSULATION

Measurement will be made by the area insulated as specified. Payment will be made under Item Polystyrene Insulation at the Contract bid price per square foot, which shall be compensation in full for all costs incidental thereto.

i. IMPROVED PIPE FOUNDATION MATERIAL

Material used for refilling to pipe foundation grade to assure firm foundation for pipe shall be paid for at the contract unit price per linear foot along the pipe in six (6) inch depth increments installed regardless of width. No foundation material will be paid for that is installed without the knowledge or consent of the Engineer nor will payment be made for rock installed only for dewatering purposes. Payment shall include cost of excavation and placement.

23) SPECIAL REQUIREMENTS OF MINNESOTA DEPARTMENT OF HEALTH DIVISION OF ENVIRONMENTAL HEALTH

Water mains crossing house sewers, storm sewers, or sanitary sewers shall be laid to provide a separation of at least 18 inches between the bottom of the water main and the top of the sewer. When local conditions prevent a vertical separation as described, the following construction shall be used:

- i. Sewers passing over or less than 18 inches below water mains shall be constructed of materials equal to water main standards of construction.
- ii. In addition, sewers passing over water mains shall be protected by providing:
 - A vertical separation of at least 18 inches between the bottom of the sewer and the top of the water main.
 - Adequate structural support for the sewers to prevent excessive deflection of joints and settling on and breaking the water mains.
 - That the length of water pipe be centered at the point of crossing so that the joints will be equidistant and as far as possible from the sewer.
- iii. Water mains shall be laid at least ten feet (10') horizontally from any sanitary sewer, storm sewer, or sewer manhole, whenever possible. When local conditions prevent a horizontal separation of ten feet (10'), a water main may be laid closer to a storm or sanitary sewer provided that:
 - The bottom of the water main is at least eighteen inches (18") above the top of the sewer.
 - Where this vertical separation cannot be obtained, the sewer shall be constructed of materials and with joints that are equivalent to water main standards of construction and shall be pressure tested to assure water tightness prior to backfilling.

[END OF WATER MAIN & APPURTENANCES]