

Birch Run Township

***Special Provisions, Technical Specifications
and Materials of Construction***

**For Alterations to the Municipal Water
System**

First Edition, December 2007

PART 1 - GENERAL

1.01 Work Included

The Contractor shall install water main and appurtenances in accordance with this specification. This work includes excavation, pipe laying, backfilling, and testing.

The Contractor shall furnish all labor, tools, equipment and materials, except as noted herein, required for the construction as shown on the plans or called for in the specifications.

The Contractor shall protect existing utilities during construction whether the existing utilities are shown on the plans or not. Utilities damaged by construction shall be repaired in a manner satisfactory to the Engineer and at the Contractor's expense. The Contractor shall call Miss Dig, 1-800-482-7171, for staking and locating the existing utilities.

Working hours for the purpose of pipe installation and any excavation work shall be from 7:00 am until 6:00pm Monday thru Friday. Clean up may be allowed outside of these hours.

Extended hours for other construction may be allowed at the digression of the township supervisor.

Final restoration and clean up for this project shall meet the approval of the County Road Commission and the Owner. The Birch Run Township (Owner) shall get final acceptance of the restoration and cleanup in writing from the County Road Commission

1.02 References

- A. A.W.W.A. C601 – Disinfecting water mains.
- B. ANSI A21.4/AWWA C104 - American standard for Cement Mortar lining for cast iron pipe and fittings for water.
- C. ANSI A21.11/A.W.W.A. C111 - American Standard for Rubber Gasket Joints for Cast-Iron Pressure Pipe and Fittings.
- D. ANSI A21.10/A.W.W.A. C110 - American National Standard for Gray Iron and Ductile-Iron Fittings, 2 inch through 48 inch for water and other liquids.
- E. A.W.W.A. C900 - Polyvinyl Chloride (PVC) Pressure Pipe, 4 inch through 12 inch, for Water.

1.03 Submittals

Submit shop drawings or manufacturer's data to the Engineer for review and approval prior to ordering for the following:

- 3.1 Hydrants
- 3.2 Valves
- 3.3 Pipe, including fittings and joints.

PART 2 - MATERIALS

2.01 General

When possible, all materials shall be manufactured in the United States.

2.02 PVC Pipe

PVC pipe shall meet the requirements of ANSI/A.W.W.A. C-900 and C-909. Pipe shall have a ratio of diameter to wall thickness of SDR 18 min, unless noted otherwise on the plans or on the proposal. The pipe manufacturer and class shall be marked on each length of pipe. Joints for pipe shall be push-on type with electrometric gaskets meeting the requirements of ASTM D3139.

PE pipe shall meet the requirements of AWWA C906. Pipe shall have a ratio of diameter to wall thickness of 11 (SDR 11), unless noted otherwise on the plans or on the proposal. Polyethylene pipe shall be NSF approved for potable water. Pipe shall meet the requirements of ASTM D-1248, Type III, Class C, Category 5, Grade P34. Pipe shall be designed for 160 psi working pressure in accordance with ASTM D-2837. HDPE pipe shall be manufactured from high density PE 3408 polyethylene resin. All HDPE materials must be listed and approved for use with potable water under ANSI/NSF Standard 14. ANSI/NSF Standard 14 meets the requirements of ANSI/NSF Standard 61. The exterior wall print line of all HDPE pipe proposed for installation and potable use must bear the NSF-pw identification. The pipe manufacturer and class shall be marked on each length of pipe.

2.03 HDPE Water main

All HDPE materials must be listed and approved for use with potable water under ANSI/NSF Standard 14. ANSI/NSF Standard 14 meets the requirements of ANSI/NSF Standard 61. The exterior wall print line of all HDPE pipe for potable use must bear NST-pw identification. In addition to A.W.W.A. C906 and ANSI/NSF Standard requirements, HDP pipe shall be manufactured from high

density PE 3408 polyethylene resin, having a dimension ratio (DR) of 11 or less and a minimum working pressure rating of 160 psi.

2.04 Fittings

Fittings shall be mechanical joint type; either cast iron or ductile iron as follows: Fittings shall meet ANSI A21.10-A.W.W.A. C110 and ANSI A21.11. Fittings shall be cement lined in accordance with ANSI A21.4/A.W.W.A. C114. Rubber gasket joints shall meet ANSI A21.11/A.W.W.A. C111. Fittings shall be rated for 250 psi, or more.

2.05 Tracing Wire

The tracing wire shall be 12 GA. THNN stranded, 600V, VW-1.

2.06 Gate Valves

East Jordan Iron Works, Mueller or approved equal, shall manufacture gate valves. Valves shall be manually operated with non-rising stems, iron body, bronze trim, resilient seat, and single-wedge type meeting the requirements of A.W.W.A. C509. Valves will be furnished with a standard A.W.W.A. 2" square operating nut that shall turn left (counter clockwise) to open and shall be indicated by an arrow cast on the operating nut skirt. All valves shall have mechanical joints and shall also meet any supplemental requirements or specifications of the Municipality. Gate valves shall also be designed for direct bury application.

Bolts and nuts for gate valves and mechanical joints shall be COR-BLUE" by NSS Industries that conform to the requirements of ASA Standard A21.11.

Design so that one person can easily remove or replace the working parts without removing the main valve seat.

2.07 Valve Boxes

Valve boxes shall be as manufactured by East Jordan Iron Works, Mueller Co. or approved equal. A valve box shall be provided for every underground valve up to and including 12" valves. All valves larger than 12" shall be placed in a gate well. The requirements for a gate well or air release manhole are listed in Section 2.14 of this specification.

Valve boxes shall be made of good quality cast iron, have a bituminous coating and shall be of the sectional, screw-type. The lower section shall be a No. 6 round base (minimum of 5 ½ inches in diameter) for gate valves up to 8" or No. 160 oval base for valves 10" and greater. In both cases the lower sections shall be enlarged at the base to fit around the bonnet of the valve. The upper section shall be arranged to screw down over the adjoining lower section and shall be full diameter throughout. Valve boxes shall be provided with cast iron lids or covers. Lids or covers shall be marked "WATER". The over-all length of valve boxes shall be sufficient to permit the top to be set flush with the final ground surface grade.

2.08 Hydrants

All fire hydrants shall be East Jordan Iron Works 5BR250 with a 5 ½ Storz connection, manufactured in accordance with standard A.W.W.A. C502 specifications and in accordance with the latest revised edition.

This item shall include the fire hydrant, an auxiliary valve, valve box, connector pieces, and mechanical joint restraint devices. These items shall be installed in accordance with the standard construction practices and the standard fire hydrant detail.

The hydrant shall be equipped with a minimum 5-1/4" compression type valve that assures a tight closure and prevents water from slowly seeping into the hydrant barrel. All hydrants shall be designed for 250 pound working pressure and shall be hydrostatically tested at 75 and 500 psi, at the place of manufacture. All castings shall be made and assembled in the USA. All hydrants shall have a breakaway hydrant barrel flange at the ground line and a safety stem coupling designed to breakaway should the hydrant be subjected to a severe impact. Each hydrant shall be equipped with two 2 1/2" hose nozzles with threads conforming to the National Standard Design. One 5 ½" Storz connection. Nozzle caps shall be secured to the hydrant with chains. The inlet to the hydrant shoe shall be 6" with flanged joint. Flanged inlets shall be faced and drilled to 125-pound template in accordance with American National Standard ANSI B16.1. Hydrants shall meet or exceed the requirements of UL 262 and FM 1510.

Hydrants shall open to the left or "Counter-Clockwise" with a standard 1" square-operating nut. The hydrant valve operator mechanism shall be designed so that the operator will have a second operating means should the 1" operating nut become inoperative. The upper operating assembly shall be weatherproof and shall have either an oil reservoir or a permanent lubrication system. Hydrants

shall not contain drain holes, or if drain holes are integrally cast in place at the place of manufacture, the drain holes shall be plugged at the factory with a bronze plug. Hydrants shall be factory painted a bright red in accordance with A.W.W.A. C-502.

The fire hydrants shall have a minimum bury of 5-1/2 feet. Where field conditions dictate the use of barrel extensions to bring the top of the hydrant to final grade plus 32 inches, the Contractor shall supply and install such extensions or order fire hydrants with a longer bury than the 5 feet. The hydrant shall be placed with the pump nozzle facing the roadway unless otherwise directed by the Owner. The centerline of the pumper nozzle shall be approximately 21 inches above finished grade.

Fire hydrants shall be anchored to water mains using restrained joints and flanged connections. Concrete thrust blocks shall be installed behind all hydrants.

The auxiliary valve shall be a 6" internal diameter gate valve constructed in accordance with A.W.W.A. C-500 specifications. Auxiliary valves shall be flanged on one end and shall be delivered factory installed onto the flanged fire hydrant shoe. The other end of the 6" gate valve can be flanged or mechanical joint but must be anchored to the main line. A cast iron valve box of 3 sectional designs shall be constructed over the auxiliary valve in accordance with Valve Boxes as listed above.

Fire hydrants shall have a 53" Fiberglass fire hydrant marker (USA Bluebook part # MB-22215) or approved equal.

2.09 Concrete

Only concrete delivered from an approved central concrete mixing plant and in conformance with ASTM specification C94 will be accepted. Equipment used for transporting concrete shall be in good condition. None of the mixture, including water, shall be added or lost by leakage or spillage from the time of loading until the concrete is discharged. Hauling units shall deliver concrete in a non-segregated condition. All concrete shall be air-entrained and shall contain 6% +/- 1% entrained air. No calcium chloride will be allowed. Concrete shall have a maximum slump of three inches as determined by ASTM specification C-143. No admixtures will be allowed without prior approval of the engineer. Concrete shall be MDOT grade 35P, 3500 psi (min)

2.10 Joint Restraints

A. Manufacturer: Mega Lug by EBBA Iron

a. Series 2000 PV for mechanical joint restraints on PVC pipe.

- b. Series 1600 for push joint / bell restraints on PVC pipe.
- B. Restrain all mechanical joints with retainer glands. Restrain all joints within length (s) according to restraint schedule.
- C. Restrain hydrants, tees, valves etc. according to manufacturers requirements for application soil type, trench detail, test pressure of 150 psi, safety factor of 2 and depth of bury.
- D. Mechanical joint restraint shall be incorporated into the design of the follower gland. The restraint mechanism shall consist of plurality of individually actuated gripping surfaces to maximize restraint capability. Glands shall be manufactured of ductile iron conforming to ASTM A536-80

The gland shall be such that it can replace the standardized mechanical joint gland and can be used with the standardized mechanical joint bell conforming to ANSI/ A.W.W.A. C111/A21.11 and ANSI/A.W.W.A. C153/A21.53 of latest version. Twist off nuts, sized same as tee-head bolts, and shall be used to insure proper actuating of restraining devices.

The restraining glands shall have a pressure rating equal to that of the pipe on which is used. The restraining glands shall have been tested to ASTM F1674-96, be listed by Underwriters Laboratories, and be approved by Factory Mutual. The restraint shall be MegaLug as manufactured by EBBA iron or approved equal.

- E. Restraint for PVC pipe bell (A.W.W.A. C-900) shall consist of the following. The restraining shall be manufactured of ductile iron conforming to ASTM A536. A split ring shall be utilized behind the pipe bell. A serrated ring shall be used to grip the pipe and a sufficient number of bolts shall be used to connect the bell ring and the gripping ring. The combination shall have a minimum working pressure rating of 150 psi. Factory Mutual shall approve the restraint. The restraining shall be Series 1600 as manufactured by East Jordan Iron Works, EBBA Iron, Inc. or approved equal.
- F. Submit to Engineer in accordance with Section 1300 Submittals, product information and restraint schedule showing locations of use.

2. Water Services (Copper & HDPE Pipe)

Water services shall be constructed of either HDPE (in accordance with the HDPE specification listed above) or Type K, soft temper copper tubing for underground use, in accordance with ASTM B-88 and B-251. The manufacturer and pipe type shall be marked on the outside of the pipe. The weight per foot of copper tubing shall meet or exceed that specified by ASTM B-251, Table II.

Copper pipe installed from the water main to the curb stop shall be at least 1 inch, unless noted otherwise.

A. Water service lines shall be of type K soft temper copper tubing with all fittings to be Mueller Co. Compression Type. Water service lines larger than one inch may be made of copper tube sized polyethylene with Muller Co. compression fittings installed with a 10 gauge coded tracer wire from meter to curb stop.

1. All stops and fittings be they corporation stops, curb stops, and joint fittings shall be fabricated of brass. Cast iron fittings will not be allowed.

B. **No flare type fitting will be allowed in this distribution system.**

2.11 Curb Stop Boxes

Manufactures: Mueller Co.

Water services boxes shall be adjustable, finish grade to 2 inches above the finish grade.

2.12 Service Meter Box

Manufacture: Mueller/Hunt Thermal Coil Meter Box

Water service meter boxes shall be manufactured of PVC with a minimum of a .300 wall thickness. The meter box shall be able to connect to 1" meters used by the Owner. Meter box piping should be able to withstand 150 psi working pressure. Meter boxes must be provided with a 4" insulating pad to help prevent freezing. Mueller/Hunt Meter Box catalog number shall be 330-CS-18-66-L-L-B-N with Lid # 790018.

1-1/2" or 2" meters will require a Mueller/Hunt EZ-Vault Meter Setter. Water service meter boxes shall be manufactured of PVC with a minimum of a .486 wall thickness. The meter box shall be able to connect to 1-1/2" or 2" meters used by the Owner. Meter box piping should be able to withstand 150 psi working pressure. Meter boxes must be provided with a 4" insulating pad to help prevent freezing. Mueller/Hunt Meter Box catalog number shall be 500-VS-24-60-L-L-B for 1-1/2" meters and a 550-VS-27-60-L-L-B for 2" meters.

2.13 Corrosion Protective Materials

Coatings: To be applied to buried nuts, bolts, threaded rod, and flanges, including those used flanged mechanical and restrained joints.

Manufactures: San Chem. Inc. 1600 South Canal St. Chicago Illinois 60616

Product: NO- OXG-GG-2

Coronado Paint product: Coal Tar Epoxy, 10 Mil (DMT)

Or approved equal

2.14 Permanent Blow-offs

A 2" blow-off shall be furnished where a high point in the water main is unavoidable due to unforeseen water main conflicts. They shall include the tapped hole, brass plug, corporation, copper pipe, and any other fittings required to accomplish this work.

Water main air release 48" diameter (minimum) manhole shall be furnished and installed wherever a permanent 2" blow-off is required. All materials shall be as follows:

A: Manhole Structure

1. Reinforced, pre-cast concrete pipe section conforming to ASTM C-478.
2. Nominal diameter of 48" or as indicated on the drawings.
3. Pre-cast reinforced concrete base.
4. O-ring rubber gasket premium type joints.
5. Plastic coated steel steps at 15" on center.
6. The water main extending thru the manhole must be connected to the manhole utilizing flexible neoprene boots with stainless steel bands. (No exceptions)
 - a. Kor-n-seal, by National Pollution Control Systems Inc.
 - b. Model Ps10, by Press Seal Gasket Corp.
 - c. A-Lok, by A-Lok products Inc.
 - d. Or equal submitted to and approved by engineer.

B: Manhole Covers and Frames

1. Castings shall be EJIW model 1120 or Neenah Foundry Company model R- 1764. Unless otherwise specified the word "water" will be cast in the center of solid covers. All covers will be solid, incapable of allowing water infiltration.
2. Manhole frame shall have four holes in the base flange for bolting to cone section.
3. Furnish 4" by 5/8 inch cadmium coated threaded studs with nuts and washers for bolting frame to cone section.
4. Manholes shall be adjusted to grade using grade rings with non-shrink mortar as indicated on the plans or in the specifications.

C: Mortar for Manholes

1. Mix mortar per ASTM C270, utilizing the Proportion Method to achieve a 28-day compressive strength of 2500 psi.
2. Thoroughly mix mortar ingredients on quantities needed for immediate use in accordance with ASTM C-270.
3. Add mixtures in accordance with manufactures instructions. Provide uniformity of mix and coloration.
4. Do not use anti-freeze compounds to lower the freezing point of the mortar.

5. If water is lost by evaporation, re-temper only within two hours of initial mixing.
6. Use mortar within two hours after mixing at temperatures of 64 degrees F, of two and one half hours at temperatures under 50 degrees F.

PART 3 - CONSTRUCTION

3.01 Excavation

The Contractor shall excavate all materials to the depths necessary to construct the water main as shown on the plans. Excavation shall include the removal of rock, dirt, abandoned pipelines, culverts, old foundations, trees, stumps and roots and similar materials encountered. Excavation, of whatever material encountered, shall be included in the contract unit prices for water main installation and will not be paid for separately.

Excavated material that is suitable for backfill material shall be neatly piled adjacent to the excavation so as to prevent cave-ins of the excavation and damage to adjacent trees, shrubs, fences and other property.

The excavated area shall be kept free of water at all times. Sheet piling and shoring shall be provided, if necessary, for the protection of the workers. The cost of sheet piling and shoring if required shall be included in the contract unit prices for water main installation and will not be paid for separately.

The Contractor shall dispose of excavated material that is not to be used for backfill.

Backfilling shall follow immediately behind trench excavation and pipe laying operations. In no case shall more than 100 feet of trench excavation be open at any one time. Any excavation left open and unattended shall be protected with lighted Type II barricades and a "snow fence" constructed around the perimeter of the excavation.

The Contractor shall excavate to the depths required to construct the water main and appurtenances as described on the plans. The trench bottom shall be smooth and free from large stones, large earth clods, and frozen material. For water main construction, trench excavation shall be to a depth sufficient to provide at least five feet cover over the top of the pipe and a four-inch sand cushion below the pipe. The trench width at a level of twelve inches above the pipe shall be no greater than 32 inches in width. The sand backfill shall be extended to a point 12 inches above the top of the pipe and shall be compacted by hand operated mechanical tampers.

In areas where the proposed construction may interfere with existing utilities, additional excavation may be required to determine the exact location of said existing utilities. This work will be incidental to the contract and no additional compensation will be due to the Contractor for this work.

In some cases, the plans may call for removing an existing water main or sewer in order to construct a new water main. The Contractor shall remove said existing pipelines and dispose of them at his expense. Open ends of an abandoned pipeline that is to be left in the ground shall be bulk headed with one course of brick and mortar. Removal, disposal and bulk heading of pipelines to be abandoned are included in the construction of water main.

3.02 Pipe-Handling

Pipe shall be handled in such a manner as to prevent the ends from splitting, damages to the protective coatings and other undesirable conditions. Pipe shall not be dropped, skidded or rolled into other pipe. The Engineer must approve repairs to damaged pipe.

3.03 Pipe-Cutting

Pipe cutting shall be done in a neat and workmanlike manner without damage to the pipe or lining and as to leave a smooth end at right angles to the axis of the pipe. An approved mechanical saw or cutter shall do cutting. Hydraulic squeeze cutters are not acceptable.

3.04 Pipe-laying

- A. Install pipe, fittings and accessories in accordance with the manufacturer's instructions.
- B. Install to the line and elevations show on the Engineer drawings. All water main shall be installed to the farthest property line of parcel (not in between property lines) unless approved by the owner.
- C. Water main shall have a minimum cover of 5 to 6 feet from proposed finish grade. Unless shown otherwise on the drawings or directed by the Engineer.
- D. After the trench or tunnel has been graded, place a minimum 4-inches of compacted TypeB, material. (Backfilling in the trench as a bed for the pipe).
- E. Hand trim for bell and spigot pipe joints.
- F. Defective pipe shall be removed from the project site, immediately. No debris, tools, clothing or other materials shall be allowed in the pipe.
- G. Pipe shall be laid in a dry trench with bell ends facing in the direction of laying. After placing a length of pipe in the trench, and after installing the

- gasket and applying the gasket lubricant, the spigot end shall be centered in the bell and the pipe pushed home and brought to the correct line and grade.
- H. Carefully lay the pipe on the bedding to insure positive bearing along the full length of the pipe.
 - I. Place 4-inches tamped Type B; fill along side the pipe, filling any void space under the pipe. Execute tamping with a T bar or other tamping device approved by the Engineer.
 - J. Place additional tamped Type B fill along side of the pipe to a height equal to the top of the pipe.
 - K. Place and compact Type B fill material to 12 inches above the top of the pipe.
 - L. Restrain pipe and fittings as detailed on the drawings.
 - M. Precautions shall be taken to prevent soil from entering the joint space. A watertight plug shall be inserted in the open end(s) of the pipe to prevent water, soil, animals or other foreign matter from entering the construction phase.
 - N. When it is necessary to deflect pipe from a straight line, either horizontally or vertically, the deflection shall not exceed the following values:

Nominal Pipe Size (In)	Push-on-Joint Maximum Deflection (Inches/18 ft. length)	Mechanical Joint Maximum Deflection (Inches/18 ft. length)
6	19	27
8	19	20
10	19	20
12	19	20
14	11	13
16	11	13

3.05 Jointing

Mechanical and "push on" joints shall be installed in accordance with the joint manufacturer's recommendations. Copies of such recommendations shall be furnished to the Engineer prior to the start of construction.

3.06 Backfilling

Backfilling shall be in accordance with the trench detail called for on the plans or as directed by the Engineer in accordance with the following:

When part of the trench is within the one on one influence area of an existing or proposed driving service, roadway, sidewalk, building or similar structure, the trench shall be backfilled with sand in lifts of ten inches and mechanically compacted to 95% of its maximum unit weight as determined by ASTM D1557.

Where the proposed water main crosses under an existing utility, the proposed water main shall be deflected above or below the existing utility in accordance with the following:

1. Maintain five feet of cover over top of proposed water main.
2. Maintain at least two feet of vertical separation between the outside of the proposed water main and the outside of a sewer, drain pipe, or catch basin lead.
3. Maintain at least one foot of vertical separation between the outside of the proposed
Water main and the outside of an existing utility other than a sewer drain pipe or catch basin lead.
4. When crossing an existing sewer, drainpipe, or catch basin lead, construct the proposed
Water main so that its joints are halfway from the utility being crossed.

3.07 Installation-Hydrants and Valves

A. General

Hydrants and valves shall be located as shown on the plans or as otherwise directed by the Engineer. Failure by the Contractor to locate said hydrants or valves as called for may result in Contractor correcting the error at his own expense.

B. Installing-Hydrants

Install in accordance with manufacture's instructions and A.W.W.A. Fire Hydrant Manual M-17. Along with the A.W.W.A. standards for traffic model hydrants this is to insure the traffic flange would break away properly when impacted. Set at plan location and grade as directed by the Engineer. Set on a concrete block with minimum dimensions of 4 inches by 8 inches by 16 inches. Set hydrant plumb. Hydrants shall be rotated up to 180 degrees to face the direction shown on the plans. The upper barrel of the hydrant shall be connected to the lower barrel with a breakable flange and breakable bolts as detailed in plans. Obtain approval of the Engineer prior to backfilling trench.

The hydrant lead shall be six-inch diameter. Excavations for the construction of hydrants and hydrant leads shall be backfilled with sand compacted to not less than 95% of maximum unit weight. That portion of the excavation outside the one on one influence of an existing or proposed roadway, sidewalk, driveway, parking lot, structure, or railroad and at least six inches above the pipe may be backfilled with suitable excavated material, compacted to not less than 90% of the maximum unit weight.

ASTM D1557 will determine the maximum unit weight of backfill material.

C. Installing -Valves

- A. Install in accordance with manufacturer's instructions. The Contractor prior to lowering in the trench shall examine valves. All nuts and bolts shall be checked to assure tightness.
- B. Valves shall be installed with the valve closed, supported on a 4" x 8" x 16" concrete block. Use larger blocks for larger valves. Backfill with type A material to 2 inch's above the flange of the valve dome.
- B. The valve box shall be set plumb and its axis shall be in line with the stem. Leave valves in the open position except for the valves that connect to the existing water main.

D. Installing -Valve Boxes

- A. Set base on Type A material a minimum of 2 inches above the flange on the valve dome and centered over the operating nut.
- B. Set box plumb and center over the valve-operating nut.
- C. Adjust the top of the valve box to match proposed finish grade.
- D. Install extensions for trench depth greater than 6'-6".

3.10 Water Services Connection

- A. The service clamp or saddle shall provide full support around the circumference of the pipe and have a bearing area of sufficient width along the length of the pipe, so that the pipe will not be distorted when the saddle is tightened. U-bolts will not be permitted.

This work shall not begin until the proposed main has been rested, disinfected, accepted by the Engineer and is in operation. Each water service pipe shall be connected to the water main through a service clamp or saddle and brass corporation stop. The water main shall be under pressure during the tapping process. The pipe shall be drilled and tapped to the appropriate size for the connection being installed.

After tapping the main and installing the corporation stop, the tap shall be tested by turning the corporation on and off. The Contractor shall correct any leakage detected visually.

The service lead shall be constructed of Type K, copper pipe. Service leads shall be normally 3/4-inch diameter unless otherwise called for on the plans or directed by the owner. The copper pipe shall be laid such that there is at least 24 inches of slack in the service line at the main. In other

words, the first three feet of trench adjacent to the main shall have at least five feet of copper pipe laid in it.

The Contractor shall leave the corporation stop in the open position and close the curb stop unless directed otherwise by the Engineer. Where an existing service is connected to a new main, both stops shall be left in the open position. The curb box shall be installed on the curb stop such that its height is adjustable at least two inches above and below grade.

The excavation resulting from water service construction or reconnections and within the one on one influence of a roadway, driveway, sidewalk, parking lot, railroad or other structures shall be backfilled by the Contractor with sand compacted to not less than 95% of its maximum unit weight as determined by ASTM D1557. Excavations not within the one on one influence of structures or paved surfaces may be backfilled with suitable native soils and shall be compacted to at least 90% of its maximum unit weight as determined by ASTM D1557.

Water services shall be buried five feet deep, unless otherwise directed.

3.08 Pressure Connections

Where called for on the plans, proposed water mains shall be connected to existing water mains by means of a pressure connection. The existing main shall be thoroughly cleaned and brushed with a wire brush at the location of the proposed connection. A mechanical joint split tapping sleeve shall be installed over the existing main and tightened in accordance with manufacturer's recommendations. A tapping valve suitable for use with the tapping sleeve shall be bolted to the sleeve. The tapping machine shall be attached to the open tapping valve and the tap made. Remove the tapping machine and the "cut-out" pipe wall and close the valve. Inspect for leaks.

3.09 Maintaining Service

The proposed water main shall be constructed, pressure tested, and disinfected before it is connected to the existing distribution system and before service leads are connected.

Only Water Department personnel shall operate valves on the existing water system. The Contractor shall coordinate work with the Water Department. The Contractor shall notify water customers in advance of water service disruption.

3.10 Pressure Leakage Testing

1. Perform after entire water main or a section between two valves has been installed and has passed the visual leakage test.

2. Each section of pipe between two valves shall be pressure tested. If the Contractor elects to test a longer distance of pipe, the shortest length between two valves shall be used for allowable leakage calculation. Contractor must then verify all gate valves are working properly
3. Fill pipe slowly, expelling all air.
4. Pressure pipe to 125 psi and maintain for one half hour.
5. Reduce pressure to 100 psi and maintain for two hours.
6. The amount of water added to maintain test pressure should be defined as the leakage. (The actual leakage shall not exceed ten gallons per inch diameter per day per mile).
7. Leakage shall not exceed 0.14 gallons per hour per inch of pipe diameter per 100 joints.
8. Read line pressure on a 4-inch diameter gauge with snubber and a range of 0 to 200 psi in 2-psi increments as manufactured by Wika Instruments Corporation, or approved equal.
9. Measure water added to the pipe with a tested water meter connected to the water supply line.
10. For short sections of pipe, water may be added through a sterilized container and the amount calculated by direct measurement.
11. Find and repair leaks.
12. Flush pipe with potable water.

The Contractor shall fill the main through hydrants or corporations. After completion of the tests, corporations made for the purpose of testing shall be plugged. When the Contractor has verified that all air is expelled and that the test pressure is maintained, the Contractor shall notify the Engineer to witness the test. If unsatisfactory results are obtained, the Contractor shall locate and repair the leak and the system shall be retested.

3.11 Visual Leakage Test

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1. When directed by the Engineer, a visual leakage test may be performed in lieu of a pressure leakage test.
 2. Place sufficient backfill to prevent pipe from buckling or shifting.
 3. Joints remain exposed.
 4. Restraints are installed.
 5. Place and block test plug at the end of the pipe.
 6. Fill pipe slowly with water expelling all air.
 7. Increase water pressure to equal pressure from existing supply water main.
 8. Visually inspect joints for leakage.
 9. Repair leaks and repeat test.
 10. Backfill after successful completion of test.

3.11 Disinfection

The Contractor shall flush the water main with potable water until discharge from the main runs clear. The main shall be chlorinated in accordance with AWWA C601.

- A. Verifying that water main is completed, flushed and clean.
- B. Inject disinfectant, chlorine solution, through a corporation stop inserted in the horizontal axis of the water main.
- C. Inject disinfectant at the beginning of the pipeline or a valve section.
- D. Then slowly fill the line with potable water from the existing distribution line.
- E. Bleed water from a valve at the end of the line to ensure distribution and prevent pressure build up in excess of 20 psi.
- F. Inject disinfectant, chlorine solution, to obtain a concentration of 40 to 50 parts per million.
- G. Chlorine residual may be checked with N, N-diethyl-p-phenylenediamine (DPD), 40 to 50 parts per million solutions will produce a deep red color.
- H. Maintain disinfectant in pipeline for 24 hours.
- I. Flush disinfectant from pipeline. The contractor shall be responsible for de-chlorinating, flushing water to local, state, or federal requirements also verify disinfectant removal with DPD reagent.
- J. The Engineer, with assistance from the contractor, will obtain samples for laboratory tests, a minimum of 24 hours after flushing the disinfectant from the pipeline, in accordance with A.W.W.A. requirements.
- L. Do not place water main into service until laboratory tests shows satisfactory results in accordance with Michigan Department of Environmental Quality standards for safe drinking water.
- M. Repeat the complete disinfection process if laboratory results deem the water unsafe for drinking.

- N. Replace corporation cocks with brass plugs when the disinfection process is complete and water is determined safe for drinking. The use of chlorine pills or tablets placed in the pipe during construction for the use in the pipe during construction to be used in the disinfecting process is prohibited.

PIPE RESTRAINT SCHEDULE FOR GROUND BURIED PRESSURE PIPES

LENGTH OF RESTRAINT REQUIRED

Deflection Angle

Pipe	22 1/2	33 3/4	45	56 1/4	67 1/2	78 3/4	90, tee or dead end
6"	8	12	16	20	25	31	59
8"	10	15	20	26	33	40	77
10"	12	18	25	32	40	49	93
12"	14	21	29	37	47	57	109

14"	16	24	33	41	54	66	125
16"	18	27	37	47	60	74	141
18"	20	30	41	53	67	82	157
20"	22	33	45	58	73	90	172
24"	25	39	53	68	85	105	202
30"	30	46	63	82	102	126	244
36"	35	54	74	95	119	146	283
42"	40	61	83	107	133	164	320
48"	44	67	92	118	148	181	356

1. This table is based on a test pressure of 150 PSI (operating pressure + water hammer). For other test pressures, all values shall be increased or decreased proportionally.
2. Table is valid for depths of bury 5 feet or greater. For depths of bury less than 5 feet, consult D. I.P.R.A. guidelines.
3. In each direction from point of deflection or termination, except for tee at which only the branch in the direction of the tee stem.

3.12 Conflicts with Existing Utilities

Excavation shall be made sufficiently in advance of pipe laying operations so that water main alignment can be adjusted to go above, below, or around existing pipes, structures, cables, or other obstacles that are encountered. Where such minor adjustments are made to the water main alignment, no additional compensation will be due to the Contractor.

Where existing electric cables, telephone cables, gas mains, or services are damaged; repairs shall be at the Contractor's expense. The repairs shall be made by the appropriate utility.

Where sewer leads are damaged, the Contractor at no charge to the Owner shall repair them. Sewer leads shall be repaired with a section of schedule 40 PVC pipe of the size encountered. Pipe of the same material as that encountered can also be used. The damaged pipe shall be cut square and the "connection" area shall be thoroughly cleaned. A rubber gasket sleeve coupling suitable for connecting the pipe sizes and materials encountered shall be furnished and installed by the Contractor or each reconnection or repair joint.

3.13 Restoration

The Contractor shall restore areas disturbed by construction activities.

3.14 Other Requirements

Upon completion of the project, Birch Run Township Water Department requires two hard copies and an electronic .PDF version of final as-built prints. The as-

built drawings should be submitted to the Birch Run Township Water Department and the Township Engineer.

The Contractor or Developer shall provide GPS coordinates of watermain components. The GPS coordinates shall be taken with an accuracy of +/- 1 foot. Recreational handheld GPS units will not be allowed for GPS coordinate generation. GPS coordinates are required for but not limited to:

1. Valves including boxes, gate wells and MH covers
2. Fire Hydrants and isolation valves
3. Service connections (curb stops and meter vaults)
4. Fittings including bends and tees
5. Blow off and Air Relief structures
6. Master Meter Pits
7. Other items required by Engineer or Owner

*****END OF SECTION*****