

PAVEMENT AND WATER MAIN SPECIFICATIONS

PART 1 GENERAL

1.1 SUMMARY

- A. Water mains and appurtenances.
 - 1. Water Mains shall be of PVC/PVCO pipe with ductile iron fittings.
 - 2. Fire Lines (Water Mains) shall be of ductile iron pipe and fittings
- B. Pavement for local roads.
- C. Disinfection of water mains.

1.2 STANDARDS

- A. All materials and conditions shall be in accordance with Standard and Specifications of the City of Perrysburg (the City), and/or the current American Society of Testing Materials (ASTM), and/or the current American Water Works Association (AWWA) standards and specifications, and/or the current Ohio Department of Transportation (ODOT) Construction Materials and Specifications (CMS), and/or the current Ohio Environmental Protection Agency (OEPA) standards and specifications. In case of conflict, the City Standard and Specifications shall take precedence.
- B. All references to Standards and Specifications are to the latest edition, unless otherwise noted.
- C. The City's Water Main Standard Details apply to these specifications

1.3 PRE-CONSTRUCTION MEETINGS, INSPECTION, AND PERMITS

- A. All construction projects involving: connection to, relocation of, future City ownership, or work within public rights-of-way, shall require a pre-construction meeting with the Design Engineer, Contractor, on-site inspection firm, and all involved City Divisions.
- B. As requested by the City, full time on-site inspection may be required and at the expense of the Developer.
- C. Water connection permits shall be obtained from the Department of Public Utilities Office, 211 East Boundary Street, 419-872-8050, a minimum of ten (10) calendar days prior to the of start of construction.
- D. Department of Public Utilities (419-872-8050) shall be contacted a minimum of seven (7) calendar days requesting on-site inspection when connecting to City utilities.

E. Before any water is obtained from hydrants for construction purposes, Contractor shall secure a hydrant meter set-up by placing a security deposit with the Department of Public Utilities Office, at 211 East Boundary Street, 419-872-8050.

F. Any work within the City's public rights-of-way requires a Street Opening Permit which is obtained from the Department of Public Utilities Office, at 211 East Boundary Street, 419-872-8055.

1.4 DEFINITIONS

A. Bedding: Material placed to a depth of 4 inches under, beside, and directly over the pipe up to a distance of 6 inches above the top of the pipe barrel, for the full width of the trench, prior to subsequent backfill operations.

1.5 REGULATORY REQUIREMENTS

A. Construction operations shall comply with the City's Noise and Vibration Control Ordinance, Section 634.11, as follows:

1. No person shall use any pile driver, shovel, hammer derrick, hoist tractor, roller or other mechanical apparatus operated by fuel or electric power in building or construction operations between 10:00 p.m. and 6:00 a.m. of the next day in a residential area or within 500 feet of a school or church, except for temporary conditions approved by the Director of Public Service.
2. No person shall perform any construction or repair work on any structure or building, or perform any excavation or road work, when such work entails the use of any power operated construction type device in such a manner that the noise created thereby substantially exceeds the noise customarily and necessarily attendant to the reasonable and efficient performance of such equipment.
3. Whoever violates any of the provisions of this section is guilty of a minor misdemeanor for a first offense and a misdemeanor of the fourth degree for any subsequent offense. Punishment shall be as provided in Ordinance Section 698.02.

B. In accordance with Ordinance 1040.07 Rule 24 of the City Streets, Utilities, and Public Services Code, "the water main contractor shall be required for two years after completion of the work, to make all necessary repairs, including filling and seeding if settlement occurs." For this Project, the water main contractor is the Contractor responsible for the performance of the work.

C. Disinfection: Comply with current version of AWWA C651, except as modified herein.

1.6 PROJECT CONDITIONS

A. Disinfection is a responsibility of Contractor who shall provide all materials, labor, and equipment; dispose of heavily

chlorinated water; and pay costs of bacteriological tests. A representative of the City will collect samples for and perform bacteriological tests. Samples shall not be taken by Contractor.

1. The City will provide, without charge, water for the initial disinfection and filling. If repeat disinfection and filling is required, Contractor to pay for all water used after initial disinfection and filling.
2. Water will be available at the current City rate.

1.7 QUALITY ASSURANCE

A. The manufacturer(s) shall provide an affidavit that all pipe, valves, hydrants, fittings, and appurtenances have been manufactured and tested in accordance with the requirements of the applicable referenced Standards. A copy of the affidavit, including the project on which the material is to be used, shall be forwarded to the City prior to construction.

B. All pipes, fittings, valves, fire hydrants and appurtenances shall be appropriately marked for identification purposes. The materials and methods of manufacture, and completed pipes, fittings, valves, and appurtenances shall be subject to inspection and rejection at all times. The City has the right to make inspections.

1.8 STORAGE AND PROTECTION

- A. At no time shall other pipes or material be placed in the pipes to be installed.
- B. Repair damage to pipe exterior and interior surfaces; pipe so damaged subject to rejection.

1.9 RESTORATION

A. All existing features that are disturbed due to construction activities, such as mailboxes, shrubs, bushes, guardrails, pavement markings, swales, sewers, catch basins, curbs, seeded areas, etc. shall be replaced to their original condition, unless otherwise specified, in accordance with current ODOT specifications and to the satisfaction of the City. Existing survey monuments, bench marks, property corner points, and control points damaged or disturbed by construction shall be replaced by a registered land surveyor, licensed in the State of Ohio.

B. Restoration of street openings shall be in accordance with the City's Standard Street Opening Repair Details.

C. In existing streets, provide a temporary pavement upon completion of backfilling operations and maintain same until the permanent pavement can be placed. Temporary pavement shall be a minimum 2-inch thick asphalt concrete mix in accordance with ODOT Item 614.13.

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- D. Regrade and reshape all road shoulders and all ditches and swales from existing high points to existing drainage structures or other outlets along the proposed improvement. Ditches, which are reshaped, shall have reasonable side slopes. Vertical or steep slopes will not be permitted.
- E. Seed all disturbed earth areas using the hydroseed method or placement of sod, both seed mixture and sod type shall be as approved by the City.

PART 2 PRODUCTS

2.1 PIPE AND FITTINGS

- A. PVC/PVCO Pipe with Ductile Iron Fittings:
 - 1. Pipe: AWWA C900, DR 18, Pressure Class 235 for 4 inch through 12 inch diameter; AWWA C905, DR25, pressure class 165 for 14 inch diameter and larger; and AWWA C909, Pressure Class 150 for 4 inch through 24 inch diameter; cast iron equivalent O.D.; integral wall-thickened bell end type incorporating elastomeric gasket; furnished in nominal 20 foot laying lengths.
 - 2. Fittings: AWWA C110 or C153, AWWA C111 rubber gasket joints, with all fittings to be polyethylene encased when buried.
 - a. Exterior Coating: Asphaltic material, or AWWA C116 fusion-bonded epoxy coating.
 - b. Interior Lining: AWWA C104 cement mortar with seal coat, or AWWA C116 fusion-bonded epoxy coating.
 - 3. Joints: Push-on, with joints within the lengths noted on the Standard Details to be restrained type joints.
 - a. Restrained joints shall be MEGALUG or retainers with Mega-Bond Coating System, as manufactured by EBAA Iron, Inc., or as approved, of ductile iron and with a working pressure at least equal to that of the PVC pipe on which to be installed, and a minimum safety factor of 2:1.
- B. Ductile Iron Pipe and Fittings:
 - 1. Pipe: Designed in accordance with AWWA C150, minimum Thickness Class 52, with polyethylene encasement when buried; manufactured in accordance with AWWA C151; furnish in minimum nominal 18 foot laying lengths.
 - 2. Fittings: AWWA C110 or C153, with C153 fittings to be polyethylene encased when buried.
 - 3. Exterior Coating: Asphaltic material. Fittings may be coated with a fusion-bonded epoxy coating in accordance with AWWA C116.
 - 4. Interior Lining: AWWA C104 cement mortar with seal coat, or AWWA C116 fusion-bonded epoxy coating.
 - 5. Joints: AWWA C111, rubber gasket, push-on or mechanical type, with restrained type joints and river crossing pipe joints to be provided within the lengths noted on Drawings.

- a. For all bolted joints, bolt length shall be such that all threads of the nut will be engaged.
- b. Restrained push-on joints shall be completely boltless; McWane Super-Lock, American Flex-Ring, U.S. Pipe TR Flex, or as approved. Restrained mechanical joints shall be MEGALUG with Mega-Bond Coating System as manufactured by EBAA Iron, Inc., or as approved, of ductile iron and with a working pressure of at least 250 psi and a minimum safety factor of 2:1.

2.2 BUTTERFLY VALVES

- A. Manufacturers: Clow, DeZurik; Henry Pratt Co.; Kennedy; or as approved.
- B. AWWA C504, Class 150B; designed specifically for buried service; stainless steel shafts; mechanical joint ends when buried, fully gasketed, grease-packed, water-tight, self-locking actuator with standard AWWA operating nut and mechanical stop limiting devices, open by turning left (counterclockwise), bolts, nuts, and washers used by manufacturer to assemble valves to be Type 304 stainless steel.
- C. If required, provide operator with an extension stem such that operating nut is located no more than 4 feet below grade. Center extension stem in the valve box by approved stem guides.

2.3 GATE VALVES

- A. Manufacturers: American Flow Control; Clow; Kennedy; Mueller; or as approved.
- B. AWWA C509 cast iron, bronze-mounted, or AWWA C515 ductile iron, bronze-mounted, polyethylene encased when buried installation; designed for 200 psi working water pressure; mechanical joint ends, AWWA C111, except for tapping valves; non-rising stem type with standard AWWA nut; stem seal consisting of at least two Buna-N rubber O-rings; open by turning left (counterclockwise); bolts, nuts, and washers used by manufacturer to assemble valves to be Type 304 stainless steel.
- C. If required, provide operator with an extension stem such that operating nut is located no more than 4 feet below grade. Center extension stem in the valve box by approved stem guides.

2.4 VALVE BOXES

- A. Coated cast iron, three-piece screw type, 5-1/4 inch shaft; heavy, neat fitting cover with the word "WATER" cast on the top.
- B. Base shall cover the entire valve bonnet section.

- C. Length sufficient such that when installed, the cover top shall be flush with surrounding surface with each section properly engaged.

2.5 FIRE HYDRANT ASSEMBLIES

- A. Includes fire hydrant, auxiliary valve and valve box, piping, and appurtenances.
- B. Fire Hydrant:
 - 1. Manufacturers: American Flow Control; Kennedy; Mueller, Clow; or as approved.
 - 2. AWWA C502, compression type, 5-1/4 inch valve opening, 5-sided operating nut open by turning left (counterclockwise); traffic model with frangible barrel section and stem coupling; positive operating drain valve installed in open position; 6 inch mechanical joint base, designed so water hammer will be prevented when properly operated.
 - 3. Two 2-1/2 inch hose nozzles, 7-1/2 threads per inch, and one 5 inch Storz steamer fitting.
 - 4. Suitable for setting in trenches of depths and in locations shown; Contractor responsible for determining hydrant depth of bury based on locations shown.
 - 5. Verify that the direction of opening, hydrant pumper nozzle, operating nut, outlet nozzle cap nuts and hose threads conform to those in the system before the new hydrants are shipped.
 - 6. Factory Finish: Each hydrant shall be given two coats of good quality weatherproofing paint before leaving the factory and another coat after installation. The portion of hydrants below ground shall be painted with black paint; the portion above ground shall be painted to match existing hydrants throughout Wood County. The color shall be submitted to the City for approval prior to application on the new hydrant.
- C. Auxiliary Valve and Valve Box: Auxiliary valves and valve boxes shall be gate valves and valve boxes as specified in Articles 2.3 and 2.4, with valves to have ends suitable for receiving the spigot end of 6 inch anchoring pipe.
- D. Piping:
 - 1. Ductile Iron Pipe: AWWA C150, AWWA C151; asphaltic material, or AWWA C116 fusion-bonded epoxy exterior coating, AWWA C104 cement mortar with seal coat, or AWWA C116 fusion-bonded epoxy interior lining.
 - 2. AWWA C110 or C153 mainline tees with standard mechanical joint branch for connecting to anchoring pipe and fittings, and mechanical joint anchoring type branch when connecting to an auxiliary valve; coated and lined as specified for pipe. C153 fittings to be polyethylene encased when buried.

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3. Anchoring pipe, plain end mechanical joint type incorporating an integral cast shoulder and follower gland.
4. Anchoring Pipe Manufacturers: American Cast Iron Pipe Company, Clow Corporation, United States Pipe and Foundry Company, or as approved.

2.6 BACKFILL

- A. Earth Backfill: Excavated earth material, finely divided and free of stones 3 inches or greater in any dimension to at least 3 feet above pipe top.
- B. Granular Material: ODOT Item 304 crushed limestone.
- C. Control Density Fill (CDF): A mix of Portland cement, fly ash and selected granular materials with a compressive strength of 100 psi; Kuhlman Corporation "K-Krete", or as approved.

2.7 BACTERIA SAMPLING AND FLUSHING ASSEMBLIES

- A. Follow Service Connection Assemblies as shown above, with the following modifications:
 1. Curb box is not required
 2. A ball valve may be substituted for the curb stop.
 - a. Manufacturers: Stockholm, Model S-216; Nibco, Model No. S-585-70 or T-585-70; or as approved.
 - b. Bronze, two-piece body, chrome-plated, brass ball, Teflon seats and stuffing box ring, lever handle and balancing stops, solder or threaded ends with union.
 3. Approved piping and fittings (90 degree elbow) shall be provided a distance of 4 feet above grade.
 4. Valve shall be located to allow individual taking sample to turn valve on-off while holding sampling jar.

2.8 POLYETHYLENE ENCASUREMENT

- A. AWWA C105, 8 mil linear low-density polyethylene tube or 4 mil high density, cross-linked polyethylene tube; 2 inch wide plastic-backed, adhesive tape, bond to both metal surfaces and polyethylene film.

2.9 TRACE TAPE

- A. Inert bonded layer plastic with metallized foil core, 6 inches wide, resistant to alkalis, acids and other destructive chemical components encountered in soils; APWA Uniform Color Code, brightly colored; imprinted indicating pipe type; Griffolyn Company Terra Tape "D", Seton Name Plate Corporation, or as approved.

2.10 JOINT BOLTS AND NUTS

- A. All ductile iron fittings, and appurtenances (valves, hydrants, restrained joints, etc.) shall be installed with COR-BLUE (COR-

TEN) bolts, nuts, and washers. B. Bolts and appurtenances shall be NSS Industries COR-BLUE (COR-TEN) Bolts, or as approved, coated with a ceramic-filled baked-on fluorocarbon resin.

2.11 BEDDING MATERIAL

- A. Fine excavated material except in paved areas; standard size No. 6 stone fill as shown at fire hydrants and at blow-off assemblies, except no slag permitted.
- B. ODOT No. 67 or No. 57 crushed limestone in paved areas.
- C. Concrete Thrust Blocks, Concrete Encasement, and Valve Box Concrete Collar: ODOT Class C Concrete.

2.12 LOCAL ROADS

- A. Asphalt Concrete Pavement:
 1. -1/2 inches ODOT Item 448, Type 1 (medium traffic) Surface Course, PG 64-22.
 2. 2 inches ODOT Item 448, Type 2 (medium traffic) Intermediate Course, PG 64-22.
 3. 10 inches ODOT Item 304, Aggregate Base (placed in 2 lifts).
 4. On aggregate base, apply ODOT Item 408 Prime Coat at rate of 0.35 gallons per square yard. Installation to be directed by the City.
 5. ODOT Item 407; apply tack coat at the rate of 0.04 gallons per square yard to be placed between intermediate and surface courses and joints.
 6. Sealer for Contact and Mating Surfaces and Joints: Comply with ODOT Items 401.14 and 401.17.
 7. Pavement Sealer: When requested by and as approved by the City.
- B. Concrete Driveways and Parking Areas:
 1. Pavement: ODOT Item 452 Non-Reinforced Portland Cement Concrete Pavement.
 2. Reinforcement: Match existing.
 - a. Commercial Drives: minimum 9 inch thick or match existing
 - b. Residential Drives: minimum 6 inch thick or match existing
 3. Hook Bolts or Deformed Bars in Roadways:
 - a. Provide 5/8-inch hook or deformed bolts where new abuts existing.
 - b. Furnish and install at 30 inches center to center where new abuts existing longitudinally.
 - c. When thickness is less than 10 inches, as determined by the City, furnish and install at 20 inches center to center where new abuts existing transversely.
 - d. When thickness is greater than 10 inches, as determined by the City, furnish and install at 26 inches center to center where new abuts existing transversely.

- C. Concrete Curbs: ODOT Item 609.04; Class C concrete.
- D. Underdrains: ODOT Item 605 using pipe 706.06, 706.07, 706.08 or 707.41.

2.13 MONUMENT ASSEMBLY (IN PAVED AREAS)

- A. Neenah Foundry Company, R 1978 A2 with bolted lid.

2.14 CURB RAMP DETECTABLE WARNING TRUNCATED DOMES

- A. Materials:
 1. Follow current ODOT Specifications 712.14 as modified herein:
 2. Truncated Domes: Shall consist of cast-in-place reinforced polymer composite tiles.
 3. Material supplied shall be red color, and installed by pressing tiles into place in the freshly poured concrete.
 4. Material supplied and installed shall meet ODOT Standard Drawings and current approved products as listed at: <http://www.dot.state.oh.us/Divisions/Engineering/Roadway/DesignStandards/roadway/Pages/Approved%20Products.aspx> (DETECTIBLE WARNINGS)

- B. Concrete: ODOT Class C.

2.15 DISINFECTION PRODUCTS

- A. Chemicals: Calcium Hypochlorite granules or 5 gram tablets; 1 percent chlorine solution (10,000 mg/l), prepared by mixing 1 pound of calcium hypochlorite (approximately 65 percent available chlorine by weight) and 8 gallons of water.
- B. Food-Grade Adhesive: Permatex Form-A-Gasket No. 2 and Permatex Clear RTV Silicone Adhesive Sealant by Loctite Corporation.

PART 3 EXECUTION

3.1 PREPARATION

- A. String pipe sections along the route of the mains so as to interfere least with pedestrian and vehicular traffic and to protect the pipe.
- B. Excavate trenches to a depth of 4 inches below the outside bottom of the pipe barrel and bell when the pipe is laid on its final grade to allow for bedding material.
- C. Do not install service connections until new mains have been successfully tested, disinfected, and placed in service.
- D. Verify that polyethylene encasement is in place, where required, before placing bedding.

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E. Water Main Minimum Height of Cover: 5 feet.

3.2 BEDDING

- A. Place bedding material at trench bottom and shape for accurate placement and proper support of pipe.
- B. Place bedding material (ODOT No. 67 or No. 57 crushed limestone) under, beside, and to 12 inches over the pipe sewer for the full width of the trench; place in 6 to 12-inch layers, loose measure, and work the crushed stone around the pipe to provide even support, to fill all voids, and to lightly compact the crushed stone (by hand).
- C. Carefully place and tamp so as not to puncture polyethylene encasement, or damage or displace joints or pipe. Do not drop material directly on pipe.
- D. Construct thrust blocks at plugs as detailed. Place against firm, undisturbed soil. Protect end of plug from concrete adhesion to allow for future removal.
- E. Construct concrete encasement under ditches as shown.

3.3 INSTALLATION - WATER MAIN PIPE AND FITTINGS

- A. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- B. Install water mains at a minimum 10 foot horizontal distance from sewers and manholes and at a minimum 18-inch vertical distance from sewers at their crossing, both as measured between the outside of pipe walls. At crossings, install one full length of water line pipe so both joints will be as far from the sewer as possible.
- C. Install pipe in locations and at grades shown or specified, except as otherwise permitted or ordered by the City to avoid existing or proposed utility lines or other obstructions encountered; to secure a more readily accessible position for trenching; or to facilitate the location of various pipe appurtenances; avoid high and low points in the main
- D. Use suitable fittings, usually 1/8 bends, when abrupt grade changes of the pipe are necessary to avoid existing utilities or other obstructions, so as to secure an easy flow of liquid and to provide sufficient cover below same unless noted otherwise.
- E. Install pipe to allow for expansion and contraction without stressing pipe or joints.
- F. Deflect pipe joints in strict accordance with pipe manufacturer's instructions.

- G. Locate pipe to maintain a minimum clearance of 18 inches in all directions, with respect to other utilities, to allow for taps to be inserted.
- H. With push-on joints, wipe surfaces that contact rubber gasket clean and dry just prior to making joint. Use a lubricant in accordance with the manufacturer's instructions when making joint.
- I. With mechanical joints, brush surfaces that contact rubber gasket with soapy water to remove all sand and grit just prior to making joint.
- J. Install tracer tape continuous over top of PVC pipe; locate 18 inches below finished grade.
- K. Install polyethylene encasement for all ductile iron pipe, fittings, and appurtenances; comply with AWWA C105 Method A and manufacturer's instructions. Completely tape all overlaps and seams. Repair all rips, punctures, and other damage to the polyethylene.
- L. Provide polyethylene encasement for each ductile iron fitting for a distance of 5 feet each side thereof; comply with AWWA C105 Method A and manufacturer's instructions. Completely tape all overlaps and seams. Repair all rips, punctures and other damage to the polyethylene.
- M. Clean all pipes thoroughly inside and outside before lowering into trench; keep pipes clean during and after laying; and seal the pipe end with a water-tight plug when pipe laying is stopped for any reason.
- N. From the top of the bedding to a point 5 feet below the adjacent ground level, backfill trenches in and within 5 feet of the edge of existing and proposed paved or stoned streets, alleys, and parking areas with granular material (ODOT No. 304 crushed limestone). Place the crushed limestone material in maximum 36-inch layers, loose measurement. Mechanically level the crushed stone and compact each layer with an excavator-mounted vibratory plate compactor that produces a rated compactive force of at least 9 psi. Each layer to receive a minimum of two complete passes, except where CDF is indicated on the Drawings.
- O. The top 5 feet of the trench shall be backfilled with granular material (ODOT No. 304 crushed limestone). Place the crushed limestone material in maximum 12-inch loose layers and mechanically compact to not less than 100 percent of the maximum dry unit weight as determined in accordance with ASTM D698 (Standard Proctor), except where CDF is indicated on the Drawings.

- P. For trenches within 5 feet from the edge of existing and proposed paved or stoned streets, alleys, and parking areas, backfill with compacted granular material as specified above for trenches coming within same.
- Q. For backfilling trenches in yard/grassed areas, replace as much of the excavated material as possible. Until backfilling has progressed to a depth of at least 3 feet over the top of the pipe barrel, use finely divided material, free of stones 3 inches or greater in any dimension, boulders and other harmful debris, and place in 18-inch layers, loose measurement, and compact by mechanical tamping. Place remainder of backfill in maximum 12-inch layers, loose measurement, and compact by mechanical tamping.
- R. For backfilling trenches within 5 feet of existing and proposed sidewalks and driveways, replace as much of the excavated material as possible. Until backfilling has progressed to a depth of at least 3 feet over the top of the pipe barrel, use finely divided material, free of stones 3 inches or greater in any dimension, boulders and other harmful debris, and place in 12-inch layers, loose measurement, and compact by mechanical tamping. In no case shall the compaction be less than 92% as determined by the Standard Proctor Test.
- S. Contractor is responsible for disinfection of the water main in accordance with AWWA C651 under Section 02675. Attention is directed to Section 4 - Preventive and Corrective Measures During Construction, of AWWA C651. If, in the City's opinion, the pipe contains dirt that may not be removed by subsequent flushing, clean and swab the pipe interior as necessary with a 1 percent chlorine solution (10,000 mg/l) prepared by mixing 1 pound of high-test calcium hypochlorite (65-70 percent Cl) and 8 gallons of water.
- T. Provide access fittings to permit testing and disinfection and bacteria sampling and flushing assemblies.
- U. When necessary to cut pipe at fittings, valves, or elsewhere, the remaining portions may be used to minimize the number of scrap pieces when the Work is complete; however, scrap pieces less than 5 feet in length shall not be used.
- V. Backfill trench for Work of this Section; follow Article 2.6.

3.4 INSTALLATION - VALVES AND FIRE HYDRANT ASSEMBLIES

- A. Maximum spacing between fire hydrants shall be no greater than 300 feet center to center distance as measured along the centerline of water main.
- B. Maximum spacing for mainline valves shall be installed no greater than 1,000 feet center to center distance as measured along the center of water main.

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- C. Set valves plumb and on solid bearing; center and plumb valve box over valve; set box cover flush with finished grade. Provide expansion joint material around portion of box in concrete pavement or sidewalks. Provide a concrete collar around valve box located if asphalt or stone pavement.
 - D. Set hydrants plumb and to grade of curb, street, alley, highway, or right-of-way with pumper nozzle toward middle line of street, highway, or right-of-way.
 - E. Set hydrant and auxiliary valve on native hardwood blocking; provide stone fill up to drainage port
 - F. If necessary, as determined by City, to set a fire hydrant at a greater depth of bury as a result of changing hydrant location from that shown, adjust elevation by furnishing and installing the fire hydrant manufacturer's standard barrel and stem extensions.
 - G. Install polyethylene encasement for all buried auxiliary valves and fire hydrant assemblies as specified for water main pipe and fittings.
 - H. Install polyethylene encasement for all buried gate and butterfly valves even if not provided for adjacent piping. Comply with AWWA C105 Method A and manufacturer's instructions. Completely tape all overlaps and seams. Repair all rips, punctures, and other damage to the polyethylene.
 - I. Paint fire hydrant exterior above ground level with two coats City's standard paint; hydrant shall be painted yellow with bonnet painted white.
- 3.5 INSTALLATION - BACTERIA SAMPLING AND FLUSHING ASSEMBLIES; BLOW-OFF ASSEMBLIES
- A. Install assemblies as shown or noted; comply with component manufacturer's instructions.
 - B. Valve shall be located to allow individual taking sample to turn valve on-off while holding sampling jar.
 - C. Remove bacteria sampling and flushing assemblies after notice from City that mains have passed all tests and have been placed in service.
- 3.6 CONNECTION TO EXISTING MAINS
- A. Connect new mains to existing mains using proper fittings and in a manner acceptable to the City.
 - B. Expose existing mains at connection points 10 days prior to making connections to determine elevation, verify type of pipe, confirm outside diameter of pipe, and identify type of restraints existing.
- 3.7 LOCAL ROADS (UNLESS OTHERWISE APPROVED OR DIRECTED)
- A. Prepare subgrade in accordance with ODOT Item 203. Where it is necessary to construct pavement subgrade in fill, remove the existing topsoil beneath the proposed subgrade.
 - B. Asphalt Concrete Pavement:
 - 1. 1-1/2 inches ODOT Item 448, Type 1 (medium traffic) Surface Course, PG 64-22.
 - 2. 2 inches ODOT Item 448, Type 2 (medium traffic) Intermediate Course, PG 64-22.
 - 3. 10 inches ODOT Item 304, Aggregate Base (placed in 2 lifts).
- 3.8 MONUMENT ASSEMBLY (IN PAVED AREAS)
- A. Place Type C monuments in accordance with ODOT Item 604, and Standard Construction Drawing RM-1.1.
- 3.9 CURB RAMP DETECTABLE WARNING TRUNCATED DOMES
- A. Material to be supplied shall meet ODOT's Office of Roadway Engineering Services Truncated Domes Approved List.
 - B. Installation shall be in accordance with ODOT's latest Standard Construction Drawings for New Curb Ramps (with Truncated Domes) BP-7.1 and Retrofitted Curb Ramps BP-7.2.
 - C. All curb ramps/retrofitted curb ramps shall include new ODOT Class C concrete where truncated dome material is to be installed.
 - D. The City will approve proposed material to be installed.
- 3.10 FIELD QUALITY CONTROL
- A. The City may check compaction of the bedding and backfill at any time.
 - B. For compacted bedding in trenches, the City may employ a testing laboratory to make tests on Site and will pay all costs for the first set of tests performed per lift. If compaction fails to meet Specifications, all succeeding tests for that lift shall be at expense of Contractor.
 - C. Check valve boxes after installation and remove stones, dirt, debris, and backfill material.
- C. No cut-ins or connections to existing mains shall be made unless at least 48 hours notice is given to the City.
 - D. Plan all connecting work to reduce number of shutoffs.
 - E. Two days prior to shutting valves on existing lines, notify all affected property owners and the City of such shutoff.
 - F. Keep shutoff time to a minimum and do at off-peak hours.
 - G. A representative of the City will operate existing valves. Contractor shall not operate existing valves.
 - H. The City assumes no responsibility for any delay occasioned by special requirements or conditions which must be met in making connections.
 - I. Take extreme care in making connections to prevent contamination
 - J. Before making connections to existing mains, wash all fittings, valves, and pipe with clean water, and then disinfect by washing with a chlorine solution having a residual chlorine strength of not less than 50 ppm.
 - K. Plugs removed from existing mains that are not damaged may be reused within the Project, and those remaining after completion of construction shall remain the property of the City.
 - L. Connections to AC pipe shall be made with appropriate fittings specifically designed for AC pipe connections, and shall be acceptable to the City. All connections to AC pipe shall be via pad adapters. AC pipe must not be cut with a saw. All cuts shall be accomplished by snap cut.
- 4. On aggregate base, apply ODOT Item 408 Prime Coat at rate of 0.35 gallons per square yard. Installation to be directed by the City.
 - 5. ODOT Item 407; apply tack coat at the rate of 0.04 gallons per square yard to be placed between intermediate and surface courses and joints.
 - 6. Sealer for Contact and Mating Surfaces and Joints: Comply with ODOT Items 401.14 and 401.17.
 - 7. Pavement Sealer: When requested by and as approved by the City.
- C. Concrete Driveways and Parking Areas: ODOT Item 452.
 - D. Concrete Curbs: ODOT Item 609.04 Type 2 Combination Curb and Gutter or Type 6 Curb.
 - E. Pipe Underdrains: ODOT Item 605.03, and as shown on ODOT Standard drawing DM-1.2 and approved Drawings.

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- D. Subject main to pressure and leakage test in accordance with Article 3.11 below.
- E. Disinfect water mains in accordance with Standard Details for Disinfection of Water Mains.
- F. When all tests on the water main have been successfully completed and the main has been disinfected, the main will be placed in service by the City. No further Work on the main or its valves shall be permitted without full knowledge and approval of the Work by the City.

3.11 PRESSURE AND LEAKAGE TEST

- A. Subject all mains to a pressure and leakage test before connecting to existing mains and before making connections between water mains of differing pipe materials.
- B. Test each valve-to-valve section separately. If Contractor elects to test more than one valve-to-valve section, the allowable leakage for the test will be based upon the shortest valve to valve section in the test
- C. For Mains of PVC Pipe Material: Perform in accordance with AWWA C605 and the following:
 - 1. Isolate main from adjacent existing main and new main of differing pipe materials, and apply pressure by pumping clean water from a sterilized container into the main via 1 inch corporation stops.
 - 2. Test pressure shall be 150 psi, unless valves in existing mains are involved within section of new main being tested, in which case test pressure may be 100 psi if the City determines that the older existing valves may not seal properly; and shall not vary by more than +5 psi.
 - 3. Start pressure test in an afternoon and keep pressure on for 18 hours, and then maintain test pressure for an additional 2 hours by pumping water from the container into the main.
 - 4. At the end of the 2 hour period, measure the water used.
 - 5. Loss by leakage shall not exceed that as determined by the following formula:

$$L = \frac{NDVP}{7,400}$$

- L = allowable leakage (gal/hr)
- N = # joints in pipe tested
- D = nominal dia. of pipe
- P = avg test pressure

- 6. When testing against closed metal-seated valves, allow an additional leakage per closed valve of 0.0078 gallons/hour/inch of nominal valve size.
- 7. When hydrants are in test section, perform test with closed hydrant valves.
- 8. Pressure test at each side of intermediate valves at this time by shutting each valve, exhausting the pressure on one side, and applying the test pressure of 150 psi or more to the main on the opposite side of the valve for approximately 10 minutes as determined by the City. Repeat this procedure for each intermediate valve.

- D. If main and valves do not pass the leakage test, locate and repair the leak or leaks and repeat testing procedure until successful. Repair visible leaks regardless of the amount of leakage.
- E. Pressure and leakage testing is responsibility of Contractor, who shall provide all materials, labor, and equipment, and pay for the total volume of water used.
- F. For Fire Lines (Water Mains) of Ductile Iron Pipe Material: The City will oversee testing. Perform in accordance with AWWA C600 and the following:
 - 1. Isolate mains lines from adjacent existing main and new main of differing pipe materials, and apply pressure by pumping clean water from a sterilized container into the main via 1 inch corporation stops.
 - 2. Test pressure shall be 200 psi, unless valves in existing mains are involved within section of new main being tested, in which case test pressure may be 100 psi if OWNER determines that the older existing valves may not seal properly; and shall not vary by more than +5 psi.
 - 3. Start pressure test in an afternoon and keep pressure on for 18 hours, and then maintain test pressure for an additional 2 hours by pumping water from the container into the main.
 - 4. At the end of the 2 hour period, measure the water used.
 - 5. Loss by leakage shall not exceed that as determined by the following formula:

$$L = \frac{SDVP}{148,000}$$

- L = allowable leakage (gal/hr)
- S = length of pipe tested
- D = nominal dia. of pipe
- P = avg test pressure

- 6. When testing against closed metal-seated valves, allow an additional leakage per closed valve of 0.0078 gallons/hour/inch of nominal valve size.
- 7. When hydrants are in test section, perform test with closed hydrant valves.
- 8. Pressure test at each side of intermediate valves at this time by shutting each valve, exhausting the pressure on one side, and applying the test pressure of 150 psi or more to the main on the opposite side of the valve for approximately 10 minutes as determined by ENGINEER. Repeat this procedure for each intermediate valve.

3.12 DISINFECTION

- A. Disinfect water mains after successful pressure and leakage tests; follow Standard Details for Disinfection of Water Mains.
- B. Make connections between new mains of differing pipe materials prior to disinfection.
- C. Disinfection - General:
 - 1. Provide corporation stops required for exhausting air, for samples for testing of chlorine residual, and for chlorine solution injection.
 - 2. Exhaust air at fire hydrants and at bacteria sampling and flushing assemblies.
 - 3. Tests for chlorine residual will be performed by the City.
 - 4. Manipulate existing valves so strong chlorine solution in the main being treated will not flow back into the mains supplying the water. Operation of existing valves will be by the City.
 - 5. After the applicable retention period thoroughly flush the main out with potable water from the distribution system until the main has approximately the same chlorine content as water in the existing system.
 - 6. Properly dispose of heavily chlorinated water. Provide required neutralizing chemical to neutralize the chlorine residual.
 - 7. Mains Less Than 24 Inches in Diameter: Use the tablet method or continuous feed method.
 - 8. Mains 24 Inches in Diameter And Larger: Use the slug method.
 - 9. Perform bacteriological tests after disinfection, and before a main is placed in service.

PAVEMENT AND WATER MAIN SPECIFICATIONS

D. Tablet Method:

1. Provide an average chlorine dose of 25 mg/l by placing calcium hypochlorite granules or 5 gram tablets in main as it is being installed.
2. Place granules at upstream end of first pipe section, at the upstream end of each branch main and at 500 foot intervals in the following quantities based on pipe diameter:

<u>PIPE DIAMETER</u> (INCHES)	<u>CALCIUM HYPOCHLORITE GRANULES</u> (OUNCES)
4	1.7
6	3.8
8	6.7
10	10.5
12	15.1
14 and Larger	D ² *15.1

Where D is the inside pipe dia. In feet – D=d/12

3. Place tablets in each pipe section, with number of tablets determined by the formula $(0.0012 * d^2 * L)$ rounded to the next highest integer, where “d” is the nominal inside diameter of pipe in inches, and “L” is the length of pipe section in feet, and place 1 tablet in each hydrant, hydrant branch, and other appurtenance. Attach tablets using a USDA approved food grade adhesive on only the side attached and at the inside top of the pipe upon pipe installation, and with approximately equal number of tablets at each end of a given pipe length.
4. Fill main with potable water such that water within the main will flow at a velocity no greater than 1 fps.
5. Take precautions as necessary to ensure air pockets are eliminated.
6. Keep water in pipe at least 24 hours, except if water temperature is less than 41 degrees F, then keep water in pipe at least 48 hours. A detectable chlorine residual should be found at each sampling point after the 24 hour period.

E. Continuous Feed Method:

1. Exhaust all air in main and flush main as thorough as possible with water pressure and outlets available. If no hydrant is installed at end of main, provide a tap large enough to develop a minimum 2.5 fps velocity in main. Disinfection can be accomplished by injecting a 1 percent chlorine solution into the main at a point not more than 10 feet downstream from beginning of new main. Pump potable water for the injector for delivering the 1 percent chlorine solution from a clean and sterile container. Control flow of water from the existing distribution system or other approved potable water source so as to flow slowly into

new main during chlorine application, with rate of chlorine application in such proportion to the rate of water entering the main that the solution of clean water and chlorine in the main will have 25 mg/l minimum free chlorine.

2. Keep the solution in the main for 24 hours, during which time all valves and hydrants in the treated section shall be operated to ensure disinfection of appurtenances.
3. At the end of the 24 hour period, the treated water in all portions of the main shall have a residual of not less than 10 mg/l free chlorine.

F. Slug Method:

1. Place calcium hypochlorite granules in main during construction.
2. Fill the main slowly and completely and exhaust all air.
3. Flush to remove particulates.
4. Flow a slug of water with 100 mg/l chlorine concentration slowly through main so the main and its appurtenances will be exposed to the highly chlorinated water for minimum 3 hours. If at any time the free chlorine residual in the slug drops below 50 mg/l, stop the flow, relocate the chlorination equipment at the head of the slug, and as flow is resumed, apply chlorine to restore the free chlorine in the slug to minimum 100 mg/l.
5. Operate valves and hydrants as the chlorinated water flows past to disinfect appurtenances and pipe branches.

G. Bacteriological Tests:

1. At least two samples taken at 24 hour intervals shall show the water to be safe.
2. At least one set of samples shall be collected from every 1200 feet of new water main, plus one set from the end of the main and at least one set from each branch.
3. Before taking a sample, allow the water to flow from the sampling point for at least 1 minute. Use bleach solution, or approved, as specified by AWWA to kill all bacteria. Nothing should be allowed to touch the lip or top of the sample bottle while the sample is being taken. No hose or fire hydrant shall be used in the collection of samples.
4. If bacteriological tests show the water to be safe, the main may be placed in service in accordance with Article 3.6.
5. If bacteriological tests show the water to be unsafe, the main shall be completely disinfected again by Contractor, at no additional cost to the City.

3.13 COMPLETION OF TESTS

- A. When all tests on the water main have been successfully completed, main will be placed in service by the City
- B. No further Work on the main, valves, hydrants, and appurtenances will be permitted without full knowledge of the Work by the City.