

**INFORMATION FOR COMMERCIAL DEVELOPMENTS  
WATER & SEWER DEPARTMENT**

**SANITARY SEWER TECHNICAL SPECIFICATIONS  
MATERIALS OF CONSTRUCTION**

**1. GENERAL**

All material used in this work shall be new, of the best quality, and shall meet the requirements of these specifications. Materials shall be sampled and tested in accordance with current ASTM Specifications or such others as specified hereinafter. The Contractor will be required to furnish certificates of conformance to ASTM or other applicable specifications. Materials shall be stored in such a manner that their condition is equivalent to new when installed.

Whenever in these specifications reference is made to the requirements of the ASTM (American Society for Testing Materials), AWWA (American Water Works Association), MDOT (Michigan Department of Transportation, Standard Specifications for Construction), ASA (American Standards Association), AASHTO (American Association of State Highway and Transportation Officials) or other standard specifications, it shall be understood that references are made to the latest modifications or revisions of such specifications.

All material to be used in this work will be inspected before being placed and all rejected material must be removed immediately and not used in the work under this Contract. Any material installed or placed without inspection shall be removed and replaced with new material if so directed by the Engineer.

The Contractor will be required to furnish such laborers as may be necessary to aid the Engineer in the examination and culling of material.

**2. GRANULAR MATERIALS FOR TRENCH BACKFILL AND SUBBASE**

*Backfill and bedding for PVC sanitary sewers and sewer utility crossings shall be MDOT class II with a modified gradation allowing 100 percent of the material to pass the 1 1/2 inch sieve or MDOT class III-A. This requirement shall apply to all details shown on the plans for PVC sanitary sewers and sanitary sewer utility crossings.*

Granular materials for trench backfill and sub base shall consist of sand, crushed stone or a combination thereof conforming to the respective requirements specified by MDOT.

When Class II material is specified, Class I material may be substituted. When Class III material is specified, Class I or Class II material may be substituted.

Only material suitable for water percolation shall be used.

**3. SEPARATION**

Sanitary sewer lines will maintain a ten (10 ft.) horizontal and 1 (1 ft.) vertical separation from any potable water line.

**4. POLYVINYL CHLORIDE (PVC) PIPE FOR SEWERS**

All sewer pipe identified as PVC on the plans shall be the size shown and meet the requirements of ASTM D3034-SDR26. Standard length shall be 13'+1". Pipe shall be bell and spigot, with spigot tapered to accept gasket joint.

All PVC pipe joints shall be rubber gasket conforming to ASTM D-3212 and ASTM D1869. Lubricant shall be water soluble, non-toxic, and have no deteriorating effect on the PVC or rubber gaskets.

All pipes shall be marked with the following information:

Manufacturer's Name  
Nominal Size  
Class

The manufacturer of the PVC pipe shall supply to the Owner a written certification that all PVC pipe supplied conforms with all specifications as stated herein and that all required tests have been performed. The certification shall be signed by an officer of the manufacturing company and the signature shall be notarized.

#### **5. SANITARY SEWER MANHOLES**

Manholes shall be constructed of precast sections meeting the requirements of ASTM C-478. Sections shall be joined and sealed with premium rubber joints. A 1/2" diameter pipe nipple with cap shall be provided as shown on the plans. Manhole frame and cover will be East Jordan 1047 or equivalent. Solid cover will have label SANITARY SEWER.

#### **6. GRAY IRON or DUCTILE CASTINGS**

Castings shall conform to the requirements for gray iron castings. The weights of the castings shall not be less than those shown on the plans. All exposed surfaces of castings shall be completely coated with coal tar pitch varnish to which sufficient oil shall have been added to make a smooth coating which shall be tough and tenacious when cold, and shall not be tacky or brittle, nor have any tendency to scale off. 24" CertainTeed Pamrex lockable hinged covers or approved equal will be used.

#### **7. CONCRETE BLOCKS FOR MANHOLE ADJUSTMENT**

Concrete block shall conform to ASTM C-139 with the following exceptions:

- 1) The blocks shall be solid curved blocks with the inside and outside surfaces curved to the required radii. The blocks shall have a groove or other approved type of joint at the ends. Curved blocks shall have inside and outside surfaces parallel.
- 2) Pre-cast concrete rings will be permitted. The rings shall be set in mortar in traffic areas. Rubber gaskets may be used in outflow areas.

#### **8. SANITARY SEWER LEADS**

The sanitary sewage lead material will be SDR 26 or equivalent and the degree of fall for the lead will be part of the construction plans. There be easily accessible and marked sewer clean outs at least every 100-ft. or at the outside of the building if less than 100-ft. with this being a minimum of two feet and a maximum of eight feet from the building.

All valve boxes and clean outs will be positioned at the proper height and surrounded with a three foot square or round, minimum six-in. deep, reinforced concrete pad and be equipped with a cast iron or steel cover. The clean out riser will have a sleeve so that there is no point of contact between the clean out and the concrete slab. This is done so that the slab can move without damaging or pulling the cleanout riser apart.

**9. CASING PIPE**

The pipe to be furnished and installed under this Contract shall be new steel pipe conforming to AWWA Standard C-202, unless otherwise specified. The pipe shall be 16” O.D. with 0.375” wall thickness. The Contractor shall provide to the Owner an affidavit of compliance with the specifications, furnished by the pipe fabricator.

No coating or lining of the pipe will be required, but any pipe showing excessive rusting, pitting or corrosion will be rejected. Field welding of the pipe shall be in accordance with AWWA Standard C-206 and joints may be butt weld or lap weld. No hydrostatic test is required.

**10. TRACING WIRE**

All non-metallic underground piping will require black 14 ga. Copperhead, tracing wire and brought to the surface (usually inside a valve box) through schedule 80 PVC pipe (Ferguson Enterprises or equal). All connections are to be made with approved waterproof wire nuts (connectors). For any directional boring extra high strength 12 ga. Copperhead wire will be used.

**11. BURY TAPE**

All underground piping will require 2 “detectable metallic underground tape placed a minimum of one foot above said pipe and preferably one foot below grade.

**12. GEOTEXTILE FABRIC**

Shall be nonwoven fabric having an equivalent opening size of 20 or less, weighing at least 3.0 ounces per square yard, and meeting the other requirements of AASHTO M-288 as modified by MDOT.

**WATER TECHNICAL SPECIFICATIONS  
MATERIALS OF CONSTRUCTION**

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All material to be used in this work will be inspected before being placed and all rejected material must be removed immediately and not used in the work under this Contract. Any material installed or placed without inspection shall be removed and replaced with new material if so directed by the Engineer.

The Contractor will be required to furnish such laborers as may be necessary to aid the Engineer in the examination and culling of material.

## **2. GRANULAR MATERIALS FOR TRENCH BACKFILL**

Granular materials for trench backfill shall consist of sand, crushed stone or a combination thereof conforming to the respective requirements specified in MDOT.

When Class II material is specified, Class I material may be substituted. When Class III material is specified, Class I or Class II material may be substituted.

Only material suitable for water percolation will be used.

## **3. POLYVINYL CHLORIDE (PVC) PIPE FOR WATERMAINS**

All PVC 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. All water mains identified as PVC on the plans shall be bell and spigot pipe of the size shown and shall meet the requirements of AWWA C-900 150 psi rated, SDR 18 (minimum). Standard lengths shall be 20' + 1". The spigot end shall be tapered to accept the gasket joint.

The bell shall consist of an integral wall section with a solid cross-section elastomeric ring which meets the requirements of ASTM D-1869, ASTM 3139 and E-477.

Pipe markings shall include the following, marked continuously down the length:

Seal of the National Sanitation Foundation  
Manufacturer's Name  
Nominal Size  
Class Pressure Rating

Lubrication shall be water soluble, non-toxic, be non-objectionable in taste and odor imparted to the water, be non-supporting of bacteria growth, and have no deteriorating effect on the PVC or rubber gaskets.

The Manufacturers of the PVC pipe shall supply to the Owner a written certification that all PVC pipe supplied conforms with all specifications as stated herein and that all required tests have been performed. The certification shall be signed by an officer of the manufacturing company and the signature shall be notarized.

## **4. HDPE WATERMAIN**

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 AWWA C906 and ANSI/NSF standard requirements, HDPE 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.

## **5. VALVE BOXES**

A valve box shall be provided for every underground valve. Valve boxes shall be of three piece cast iron, Buffalo pattern screw type, 5-1/4 inch shaft, of the length suited to the valve depth. The cast iron lid shall have the word "Water" cast in it. The bases of the boxes shall be round or oval pattern of the proper size for the valve. The valve boxes shall have a bituminous coating, **Manufactured in the USA by East Jordon Iron Works or equal**. All valve boxes will be surrounded with a three foot square, minimum 6" deep, reinforced concrete pad at final grade level.

## **6. TAPPING SLEEVE AND VALVE**

The tapping sleeve shall consist of two sections of heavy welded stainless steel which bolt together on the pipe and seal against a concave wedge gasket around the tap opening. The outlet half shall have a flag to mate with a standard tapping valve and a 3/4" NPT test plug.

The body shall be stainless steel. The nuts and bolts shall be stainless steel. The finish shall be a fusion bonded epoxy coating. The tapping sleeve shall be a Smith-Blair type 663 or approved equal.

The tapping valve shall be designed for leak tight attachment to the tapping sleeve and tapping machine, and shall meet the requirements of resilient wedge valves specified for this project. The valve shall be furnished with a mechanical joint end for extending the branch line.

## **7. RESILIENT WEDGE VALVES**

Valves shall be manufactured in accordance with the applicable provisions of ANSI/AWWA C509. Bonnet and body metal thickness shall exceed the minimum thickness permitted by ANSI/AWWA C153/A21.53-88. External bonnet and bonnet cover bolting shall be stainless steel hex head bolt and nut.

External and internal surfaces of the valve body and bonnet shall have a fusion bonded epoxy coating complying with ANSI/AWWA C550 applied before assembly. Valves shall be provided with two o-rings above and one o-ring below the thrust collar. O-rings above the thrust collar shall be replaceable without removing the stem. To minimize operating torque, thrust washers shall be used above and below the thrust collar. Also, the thrust collar area shall be provided with a food grade lubricant sealed between the o-rings adjacent to the thrust collar.

The seating mechanism shall be a one-piece wedge design. The single Ductile Iron Wedge shall be encapsulated with a bonded in place Nitrile elastomer covering. Minimum thickness of the rubber seating area shall be 1/4 inch. The wedge shall be symmetrical and capable of sealing with flow in either direction and with equal torque. The valve shall be designed so that no exposed metal seams, edges or screws are within the waterway when the valve is in the closed position. The wedge shall engage the stem by use of a stem nut independent of the wedge. The stem shall be in full compliance with Section 4.7 of ANSI/AWWA C509, latest revision and be removable without removing the valve bonnet. The waterway shall be smooth with no bottom recesses.

Valves shall be furnished with the ends designed for connection to the piping specified. Mechanical joints and push on joints shall be in compliance with ANSI/AWWA C153/421.53.

Proof of design and production testing shall be conducted in accordance with Section 6 of ANSI/AWWA C509 as modified for a rated working pressure of 250 psi. A notarized certificate confirming testing shall be furnished upon request by the purchaser.

Manufacturer shall, at the request of the purchaser, demonstrate evidence of mathematical analysis verifying design.

Valves shall each have a valve box and be equipped with a 2" square wrench nut for key operation. Valves shall open left.

## **8. HYDRANTS**

Hydrants shall be "Mueller Centurion" (Cat. No.A-423) or East Jordan "WaterMaster" model #5CD250, with a mechanical joint shoe. The hydrants shall not be self draining.

Hydrants shall have two 2-1/2 inch National Standard Fire Hose connections and one 5-inch lockable Storz Connection. All nozzles shall be on a movable head on the hydrant barrel so that they may be rotated by changing the position of the

top flange without removing the barrel. Hydrants shall open to the left. Operating nut and nut caps shall be 15/16" square.

Hydrants shall be plainly marked with an arrow near the operating nut showing the direction to open. Hydrants shall be of proper length for installation in a trench of the depth shown on the plans.

Each hydrant shall be tested to 300 pounds hydrostatic pressure from the inlet side, first with valve closed and second with valve open.

Hydrants shall be painted red above the grade line and black below the grade line.

The hydrant shall be designed so that one person can easily remove or replace any or all of the working parts of the hydrant without removing the main valve seat.

All hydrants shall have a fire hydrant marking flag Pollard P68801 or approved equal.

No loose landscaping material, plantings, etc. will be allowed for within 20ft. of a hydrant.

## **9. DUCTILE IRON PIPE AND FITTINGS**

Ductile iron pipe shall conform to ASA Standard A21.51. Class 52. The pipe shall be furnished with mechanical joints or push on joints conforming to ASA Standard A21.11.

A certification from the foundry supplying pipe shall be furnished to the Owner certifying that all ductile iron pipes conforms to the Standards given above.

The pipe shall be cement-lined and seal-coated in conformance with ASA Standard A21.4.

All fittings shall conform to the requirements of ASA Standard A21.10. Fittings shall have a pressure rating of 250 psi.

A certification from the foundry supplying the fittings shall be furnished to the Owner certifying that all fittings comply with ASA Standard A21.10 and that all specified tests have been made and the results comply with the requirements of the Standard.

Interior Coating and Lining. All fittings shall be cement-lined and seal-coated in accordance with ASA Standard A21.4.

The exterior of all pipe and fittings to be underground shall be coated as specified in ASA Standards A21.51 and A21.10.

## **10. 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 no 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 3" as determined by ASTM-C-143. No admixtures will be allowed without prior approval of the Engineer.

Concrete shall be MDOT Grade 35 P, 3,500 psi (min).

## **11. JOINT RESTRAINT FOR POLYVINYL CHLORIDE (PVC) PIPE**

### **PUSH JOINTS**

Iron retainers for PVC pipe bells shall be cast from 60-42-10 ductile iron. These devices shall have a sufficient number of ductile iron tie bolts to restrain working and test pressures as stated by the manufacturer. Each ductile clamp shall have serrations on the ID. These devices may be used to restrain pipe joints adjacent to the restrained fittings.

### **MECHANICAL JOINTS**

Mechanical joint restraint may be incorporated in the design of the follower gland. The restraint mechanism shall consist of a plurality of individually activated 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 bell conforming to ANSI/AWWA A21.11/C111 and ANSI/AWWA A21.53/C153 of latest revision. 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 PVC pipe on which it is used and shall be EBAA IRON, Inc., Megalug, or equal. Mechanical joints shall conform to the requirements of ASA Standard A21.11. **Bolts and nuts for mechanical joints shall be "COR-BLUE" by NSS Industries.**

## **12. POLYETHYLENE ENCASEMENT**

Polyethylene encasement for fittings, valves, and hydrants shall meet the requirements for ASTM D-1248 Polyethylene Type I, Class C, 8 mills thick, AWWA C105.

## **13. CLOSING TAPE**

Closing tape shall be 2" wide Poly Ken #900 or Scotchwrap #50.

## **14. WATER SERVICES**

The water services shall be of the diameter shown on the plans "K" copper tubing with the following accessories:

- a) **Service Clamp** - The clamp shall be bronze double strap fitting O.D. of AWWA C-900 pipe, with Mueller (cc) thread, and an O-Ring seal cemented in the throat of the tapping. Mueller type BR2B is approved equal.
- b). **Corporation Stop** - The corporation stop shall be bronze with precision fitted and lapped ground key stop. The stem washer and nut shall be bronze. The inlet threads shall be Mueller (cc). The outlet of the body and the long skirt outlet nut shall have opposing convex surfaces providing a water tight connection without compressing the flange end of the copper tubing.
- c). **Tee Head** - Mueller type B-25204 or approved equal.
- d). **Curb Box** - The curb box shall be an iron casting, weighing not less than 18 pounds, 6 feet in length when fully extended, have the capacity to telescope one foot, with an arch pattern base. The box shall be furnished with a stationary stainless steel rod and pin. The box shall be Mueller Cat No. H-10314, or approved equal.
- e.) **Meter Valve** - An approved water meter valve is to be used ahead of all meter(s) i.e. Mueller 300 ball angle meter valve, (no gate valves allowed prior to any meter).

**15. AGGREGATE FOR ROADWAY REPAIRS**

The aggregate shall be dense graded Michigan Series No. 21AA modified aggregate base.

**16. BITUMINOUS MIXTURE**

Bituminous surfacing mixtures shall consist of bituminous material, aggregates, mineral filler and such other additives as may be required, combined in the proportions and in the manner specified by MDOT, in a bituminous mixing plant. The asphalt mix shall be MDOT 4C.

**17. TRACING WIRE**

All non-metallic underground piping will require blue 12 ga. Copperhead, tracing wire and brought to the surface (usually inside a valve box) through schedule 80 PVC pipe (Ferguson Enterprises or equal). All connections are to be made with approved waterproof wire nuts (connectors). For any directional boring extra high strength 12 ga. Copperhead wire will be used.

**18. BURY TAPE**

All underground piping will require 2 “detectable metallic underground tape placed a minimum of one foot above said pipe and preferably one foot below grade.

**19. TOP SOIL**

Topsoil shall consist of dark, organic natural surface soil. Topsoil shall be approved by the Engineer prior to placement in the project area.

**20. MECHANICAL JOINT AND BOLT CONNECTIONS**

All bolts, nuts and flanges including those flanged, mechanical and restraint joints that are directly buried shall be thoroughly coated with a corrosion protective material equal to NO-OXG-GG2 summer grade or an approved equal. COR-BLUE bolts and nuts do not require coating.

**21. SEPARATION**

Potable water lines will maintain a ten (10 ft.) horizontal and 1 (1 ft.) vertical separation from any non-potable water line.

**22. DEPTH OF BURY**

All potable water lines will maintain a depth of bury at a minimum of 5 ft. 6 in. at finish grade.