Pipe material for sewer shall be polyvinyl chloride (PVC), reinforced concrete or ductile iron as specified below.

- PVC Pipe
- a. PVC pipe 8-inches thru 15-inches in diameter shall meet or exceed all of the requirements of the current ASTM D-3034 for heavy wall SDR-26 polyvinyl chloride sewer pipe and fittings. 18-inch diameter PVC pipe shall meet or exceed all requirements of the current ASTM F-679 for heavy wall SDR-26 polyvinyl chloride sewer pipe and fittings.
- b. PVC pipe shall be jointed with ring gasketed bell ends. Jointing materials shall be applied to the bell end of the pipe at the point of manufacture in such a manner that a tight uniform joint will be achieved and such that when the joint is made up in the field, the joint material will not roll or tear from the pipe. A proper joint lubricant shall be furnished by the pipe manufacturer.
- c. PVC corrugated pipe with a smooth interior 8-inches through 10inches shall meet or exceed all of the requirements of the current ASTM F-949 for heavy wall A-2026 polyvinyl choride sewer pipe
- 2. Reinforced Concrete Sewer Pipe
- Reinforced concrete sewer pipe shall conform to the requirements of ASTM C76,
- b. Joints shall conform to the requirements of ASTM C443, "Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets" with the exception that gasket material shall be synthetic rubber only. Joints in concrete pipe having a diameter of 30 inches or larger shall be pointed on the inside with mortar after backfilling has been completed. A proper lubricant shall be supplied by the manufacturer.
- c. Concrete pipe can be used for sewer 15-inches in diameter and greater.
- 3. Ductile Iron Pipe
- a. Ductile—iron pipe shall be Pressure Class 250 and shall meet current requirements of ANSI A21.50. Ductile iron pipe and fittings shall also be poly-wrap encased per the requirements for Ductile—iron water main.
- b. The Township requires an interior pipe coating when ductile iron pipe is used (Protecto 401 or approved equal) as recommended by the manufacturer to defer potentially corrosive action from the sewage. Because the depth of the sewer will be significant when ductile iron pipe is used, this requirement is mandatory.
- Mechanical type joints, when specified, shall conform to the current ANSI A21.11, "Rubber Gasket Joints for Cast Iron Pressure Pipe and Fittings." Bolts and nuts shall be Cor-Blue T-Bolts with a ceramic-filled, baked on fluorocarbon resin.
- d. Push—on type joints, when specified, shall conform to the current ANSI A21.11, and shall be "Tyton", "Super Bell—Tite," or approved equal.
- 4. Force Mains (Sanitary Sewer Pressure Pipe)

All open cut force mains shall conform to the ductile-iron pipe requirements for gravity sewers. Pressure testing of force mains shall follow the pressure test requirements for water mains of similar material. Tracer wire shall be installed along all force mains. Tracer wire shall meet the material requirements of tracer wire for water main and be green in color.

- 5. Directional Drill Materials for Forcemains and Gravity Sewers:

Sanitary sewer pipe and fittings shall be high density polyethylene plastic pipe, DR11, IPS, manufactured in accordance with the specifications and

Materials used for the manufacturing of polyethylene pipe and fittings shall be extra high molecular weight, high density PE 4710 polyethylene resin meeting the ASTM D3350 minimum cell classification of PE 345464C. The cell classification properties of the material shall be certified by the supplier

Polyethylene material shall have a minimum Hydrostatic Design Basis (HDB) of 1600 psi at 73.4°F when tested in accordance with ASTM D2837.

HDPE fittings shall be in accordance with ASTM D3261 (butt fused) and shall be manufactured by injection molding, a combination of extrusion and machining, or fabrication from HDPE pipe conforming to this specification and by the manufacturer of the pipe. The fittings shall be fully pressure rated and provide a working pressure equal to that of the pipe with an included 2:1 safety factor. The fittings shall be manufactured from the same base resin type and cell classification as the pipe itself. The fittings shall be homogeneous throughout and free from cracks, holes, foreign inclusions, voids, or other injurious defects.

The HDPE pipe shall contain no recycled compound except that generated in the manufacturer's own plant. The physical appearance of the pipe having deformities such as concentrated ridges, discoloration, excessive spot roughness, pitting, varying wall thickness, etc. shall constitute sufficient basis for rejection. The HDPE pipe shall be homogenous throughout, free from visible cracks, foreign inclusions and other defects that may affect the wall

Any pipe that is damaged or does not meet with the ENGINEER's approval shall be replaced at the CONTRACTOR's expense.

A certificate of "Compliance with Specification" shall be furnished for all materials to be supplied.

b. PVC, C-900 or C905

Fusible PVC plastic material for pipe shall conform to AWWA C900 or C905, DR-18 (C900) OR DR25 (C905), IPS, ASTM D2241. Compound formulation shall be in accordance with PPI TR-2/2006.

Pipe shall be manufactured with 100% virgin resin. Pipe shall also have 0% recycled plastics content, and shall not consist of any rework compound, even that obtained from the manufacturer's own production using the same

Fusible PVC pipe shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe.

Fusible PVC pipe shall be manufactured in 40' nominal lengths.

Fusible PVC pipe shall be green in color.

Pipe shall be marked per AWWA C900 or AWWA C905 as specified on the plans, and shall include as a minimum:

- 1. Nominal size
- 2. PVC
- 3. Dimension Ratio, Standard Dimension Ratio or Schedule DR—18 (C900) OR DR-25 (C905), IPS
- 4. AWWA pressure class or rating Pressure Class 150
- 5. AWWA Standard designation number
- 6. Extrusion production-record code
- 7. Trademark or trade name
- 8. Cell Classification 12454 and/or PVC material code 1120 may also be included.

Acceptable ductile iron mechanical fitting for use with fusible PVC pipe shall include standard ductile iron fittings conforming to AWWA/ANSI C110/A21.10 and AWWA/ANSI C111/A21.11. Restrained connections to fusible PVC pipe may be made using a restraint gland product for C-900 or C-905 DIPS sizing to be Mega—lug, Series 2000PV by EBAA Iron or approved equal.

Sleeve—type mechanical couplings shall be manufactured for use with PVC pipe, and may be restrained or unrestrained as indicated on the drawings and in these specifications for pressure or gravity applications. Acceptable sleeve—type mechanical pipe couplings shall include for unrestrained coupling Smith—Blair Omni—Coupling, Dresser Style 253 or Long Style 253 or approved equal. Acceptable sleeve—type mechanical pipe couplings shall include for restrained coupling, EBAA Iron Series 3800 or approved equal. Wire to be used for tracer purposed on directional drilling force main shall be AWG#6 stainless steel number 6 loraded tracer wire.

6. Pipe Markings

All sanitary sewer pipe shall have the class and date of manufacture marked on each length by the manufacturer. In addition, the lot number shall similarly be marked on all reinforced concrete pipe.

- 1. Fittings shall be of the same material as the pipe, and in no case shall the walls be thinner than that of the pipe furnished.
- 2. Wye and tee fittings for PVC pipe shall be reviewed by the Township Engineer before purchasing.
- 3. The dry fit of all fittings must be snug. If the fit is such that it is loose, the pipe or fitting will be rejected as faulty and of improper size.

### **BUILDING LEADS**

### Size and Length

Minimum size for building sewer and building lead shall be 6-inch nominal internal diameter. Generally the maximum length of building sewer and building lead shall be 100 feet as measured from the main sewer to the building. Clean out shall be installed at maximum intervals of 75 feet.

- 2. Allowable Types of Pipe and Pipe Joints
- a. 6—Inch Nominal Diameter Pipe

Polyvinyl chloride (PVC) solid wall pipe shall conform to the requirements of ASTM for such pipe, and shall be not less than Heavy Wall SDR 23.5

- b. Larger Size Pipe
- Larger size building leads shall be constructed of materials permitted in these standards for sanitary sewer.
- c. Joints for Wyes, Tees and Stoppers

Joints for wyes, and stoppers shall be of the same type as the joint used for the sanitary sewer pipe except as otherwise noted.

## **MANHOLES**

- Manholes shall be constructed of precast reinforced concrete sections meeting the requirements of A.S.T.M. Specification C-478 except that a wall thickness of 5" will be required. The length of each riser shall be in multiples of 16". Length of the cone shall be 2'-8" min. Two lift holes will be permitted in each unit, and must be filled with non-shrink mortar after setting the manhole.
- 2. Manholes and grade rings shall conform to the current ASTM specifications for precast reinforced concrete manhole sections, serial designation C478. Manhole section joints shall be of the o-ring type. Dome sections shall be straight side type.
- 3. Cone section shall be eccentrically constructed precast reinforced concrete.
- 4. Mortar for plastering manholes shall be made of one part Portland cement and two parts fine aggregate.
- 5. A 1/2-inch diameter galvanized capped test pipe shall be installed through the manhole wall and extend 2-inches into the manhole at an elevation equal to the top of the lowest sewer pipe.
- 6. Each frame and cover shall have machined bearing surfaces and shall be suitably notched for convenient removal of the cover. Each cover shall be marked "NORTHVILLE TOWNSHIP SANITARY SEWER" in raised letters spaced in from the periphery of the cover. Each manhole frame and cover shall have a minimum inside diameter of 24-inches.
- 7. All manhole frames and covers shall be coated by the manufacturer with coal tar pitch varnish or other asphaltum coating reviewed by the Engineer.
- 8. Covers and frames shall be furnished with a neoprene gasket. Covers & frames shall be East Jordan Iron Works 1040-Z frame and 1040-AGS Cover or approved
- 9. Sanitary manholes located in environmentally sensitive areas (flood plains, wetlands, etc.) shall have water tight covers & frames. Covers & frames shall be East Jordan Iron Works 1040-Z frame & 1040-AWT cover or approved equal.
- 10. Manhole steps shall be reinforced polypropylene plastic coated. They shall be M.A.
- 11. Manholes with precast flow channels are not permitted. Concrete channels must be poured from the upstream invert(s) to the downstream invert with a smooth, consistent arade.
- 12. Manholes within pavement shall have brick adjustment and shall use Manhole Internal Frame Seals as manufactured by NPC or approved equal.

# MANHOLE CONNECTIONS

- 1. Sewer pipe to manhole connections shall be through:
- a. a flexible rubber boot which shall be securely clamped into a core-drilled pipe port. Pipe ports shall be core-drilled at the point of manhole manufacturer and shall be accurately located within 1/2-inch of proposed sewer centerline; or,
- b. a self-adjusting mechanical pipe to manhole seal which provides a resilient flexible and infiltration—proof joint (Res—seal); or,
- c. a flexible rubber wedge firmly rammed into a rubber gasket which is cast into the manhole (Press Wedge II), or equal.
- 2. Neoprene rubber for the manhole boot shall meet ASTM Specifications C443 and shall have a minimum thickness of 3/8-inch. Pipe clamp bands shall be of corrosionresistant steel.
- 3. The void between the flexible boot to the sewer pipe shall be filled with Greatstuff Pro expandable foam as manufactured by DOW Chemical, or approved

# B. CONSTRUCTION

# **EXCAVATION**

The CONTRACTOR shall do all the excavation required for the construction of the sewer, including clearing of the site for the work and the removal and disposal of all materials necessary for construction

Excavated materials may be temporarily stored along the trench, unless otherwise noted, in a manner that will not cause damage to trees, shrubs, fences, or other property, nor that will endanger the bank stability of the trench by imposing too great a load thereon.

Excavations shall be adequately braced and/or sheeted to prevent caving or squeezing of the soil, or disturbing existing utilities or pavement, and shall be completely dewatered prior to construction of the sewer.

The subgrade shall be accurately prepared to line and grade so that the pipe, when laid, shall have uniform bearing upon the approved bedding, throughout its length.

The trench shall be backfilled closely behind the pipe laying. Unless otherwise directed or permitted by the Township Engineer, the backfilling shall follow at least two lengths behind pipe laying and shall be completed to the top of the trench not more that ten lengths behind pipe laying.

Pavement cutting, maintenance and reinstatement shall be done in a manner satisfactory to the Wayne County Department of Public Services and/or the Township Engineer.

# PIPE INSTALLATION

Installation of PVC pipe shall be in conformance with ASTM D2321-72.

All pipe shall be laid true to the required lines and grades. All trenches when pipe laying is in progress shall be kept dry; and all pipes and fittings shall be uniformly supported on a properly trimmed bedding with holes at each joint to receive bells. All pipe shall be laid with bells uphill.

All joints shall be made up in accordance with the manufacturer's instructions using materials and equipment especially prepared for the type of joint to be used.

The grade as shown on the profiles is that of the pipe invert and that to which the work must conform. The grade shall be kept by levels, laser or other tools. Each pipe shall be laid accurately to the line and grade as shown on the Plans and in such manner as to form a close concentric joint with the adjoining pipe and prevent sudden offsets of the invert. The interior of sewers shall, as the work progresses, be cleaned of all dirt, cement, depris and other superfluous materials of every description. Bulkheads shall be used to keep foreign materials out of the open end of the sewer when work is not in progress.

All pipe and fittings shall be carefully lowered and moved into position in the trench or vault in a controlled manner to prevent damage to the pipe and any coatings or lining. An excessive amount of scratching on the surface of the PVC pipe will be considered cause for rejection.

All cutting of the pipe shall be done in a neat workmanlike manner with the least amount of waste and without damage to existing or new lines. A fine tooth saw, tubing cutter or similar tool may be used to cut PVC pipe. Cuts must be square. Ragged edges shall be removed with a cutting tool or file.

After cutting bell and spigot or socket pipe, a stop mark shall be made with a pencil or crayon using dimensions as shown by the manufacturer's instructions or by using another pipe in the field as a guide.

Breaks in pipe or joints shall be repaired to the satisfaction of the Township Engineer.

The main shall be laid on a compacted granular cushion, minimum 4-inches thick. Granular backfill material shall be placed around and above the main to a height of not less than 12—inches above the crown of the pipe.

Granular material shall be Class II material as defined in MDOT 902.08 and shall be placed in not more than 12-inch layers and compacted to not less than 95% of the maximum unit density as determined at optimum moisture content.

#### Backfill is defined as that material placed into the trench from the top of the standard pipe bedding to the ground surface.

# <u>Location</u>

Trench Backfill Options are as follows:

Open areas and all areas not in compliance with the trench locations identified for trench B.

<u>Backfill Requirements</u>

Selected excavated or other approved backfill material shall be placed, after standard bedding specified above has been completed. Compaction of backfill shall be such as to obtain not less than 90% of its maximum unit weight.

Under existing or proposed pavement. Sidewalk, paved driveways, curb and gutter, and where pipe bottom is within one on one influence of pavement.

Backfill shall be full depth mechanically compacted Class II granular material constructed in 12" layers, loose measure, with each layer compacted to not less than 95% of its maximum unit weight at optimum moisture content per A.A.S.H.T.O.-180 or by M.D.O.T. Cone Density Method.

Trench B backfilled areas shall be tested for compaction by an independent testing laboratory. Intervals of testing shall be one test per layer per 75 feet of trench or as determined necessary by the Township Engineer. The cost of the testing services shall be paid for by the Contractor.

For areas not requiring granular backfill, backfill shall be of the excavated material, with the exception that materials such as soft clay, topsoil, muck, cinders, vegetable matter, refuse, stone larger than 3 inches and other objectionable and nonpacking earth shall be excluded from the backfill and removed from the site by the Contractor.

Backfill shall not be placed against any portion of a structure until the structure has passed inspection and has been approved by the Township Engineer for backfilling. All trenches should be backfilled as soon as inspection is completed in order to avoid unnecessary risk or damage to the structure and also to reduce the risk of accidents involving the public.

Prior to backfilling, all underground utilities encountered, shall be adequately protected by the use of supporting concrete or timber bents (to be left in place) of such a size and construction as to effectively prevent failure of the utility in settlement.

If a bulldozer or other machine is used to place the backfill material; no material shall be pushed or dropped into the trench, but shall be placed on the sloping ends of the completed backfill, and allowed to roll in place to the bottom of the trench.

When tunneling of the sewer is required it shall be in accordance with the current Wayne County Department of Public Services Requirements for Construction within Road Right of Way or Parks under Jurisdiction of the Board (Revised June 1, 1980).

When tunneling by jacking or boring, all voids shall be filled by means of pressure grouting with a 1:3 cement-sand mortar. This work must be accomplished within 24 hours after the conduit crossing has been completed. The tunneling shall extend a minimum of 10 feet outside the edges of the County road pavement. Pressure grouting will not be

# DIRECTIONAL DRILL APPLICATIONS

1. Joining of Polyethylene Pipe or Polyvinylchloride (PVC) Pipe Main Line

required for casings 4" in diameter or smaller unless the voids are 1" or larger.

Sections of polyethylene pipe shall be assembled and joined by the butt fusion process into continuous lengths on the job site above the ground. The joining method shall be the heat fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations and ASTM Standard D2657 Practice for Heat-Joining of Polyolefin Pipe and Fittings. The heat fusion equipment used in the joining procedures shall be capable of meeting all conditions recommended by the pipe manufacturer. Hot fusion joining of HDPE end sections and fittings may be performed

in the excavations. Joint strength shall be equal to the pipe as demonstrated by testing requirements. All

fusion joints shall be completed as described in this specification All joints shall be inspected by the ENGINEER before the pullback. The pipeline shall be joined on site in appropriate working lengths near the exit pit. In determining the maximum pulling length, the CONTRACTOR shall consider the physical condition at the job site and limitations of his equipment.

Fusible pipe will be fused by qualified fusion technicians, as documented by the pipe supplier. Training records for qualified fusion technicians shall be available to OWNER or ENGINEER upon request.

Each joint fusion shall be recorded and logged by an electronic monitoring device (data logger) affixed to the fusion machine. Joint data shall be submitted as part of the As-Recorded information, in accordance with this specification.

The fusible pipe will be installed in a manner so as not to exceed the recommended bending radius.

Where fusible pipe is installed by pulling in tension, the recommended Safe Pulling Force, according to the pipe supplier, will not be exceeded.

Only appropriately sized, and outfitted fusion machines that have been approved by

the pipe supplier shall be used for the fusion process. Each fusion joint shall be recorded and logged by an electronic monitoring device (data logger) connected to the fusion machine. The fusion data logging and joint report shall be generated by software developed specifically for the fusion of fusible PVC or HDPE pipe. The software shall include dimensional data and interfacial pressure relationships that are specific to either HDPE or PVC pipe depending on which material is utilized. Data not logged by the data logger shall be logged

manually and be included in the fusion technician's joint report.

2. Guided Drilling

The drilling equipment shall be capable of placing the PVC or HDPE pipeline within the proposed line and grade without inverted slopes.

The guidance system shall have the capability of measuring inclination, roll and azimuth. The guidance system shall have an independent means to ensure the accuracy of the installation. The CONTRACTOR shall demonstrate a viable method to eliminate accumulated error due to the inclinometer (pitch or accelerometer). The guidance system will be capable of generating a plot of the borehole survey for the purpose of an as-built drawing. The CONTRACTOR shall also prepare to provide alternative methods such as gyroscoping, ground penetrating radar or "intelligent" pigs

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to determine the as-built position.

REV. | 5 | 01/10 | MISCELLANEOUS REVISIONS FOR ORDINANCE UPDATES REV. 4 08/07 UPDATED PER TOWNSHIP 3 1/06 | REVISED PER WAYNE COUNTY COMMENTS REV. | 2 | 9/02 | ADDED SANIT. SEWER CONSTR. NOTES 8-13 1 4/01 REVISED PIPE STANDARDS AND ADDED BUILDING LEADS 11/96 ORIGINAL ISSUE: CHECKED BY: G.A.T., C.J.E DRAWN BY: B.W.A

REV. 6 01/13 MANHOLE COVERS & FRAMES

The entry angle of the pilot hole and the boring process shall maintain a curvature that does not exceed the allowable bending radius of the PVC or HDPE pipe respectively.

The CONTRACTOR shall follow the pipeline alignment as proposed on the Drawings. If adjustments are required, the CONTRACTOR shall notify the ENGINEER for approval prior to making the adjustments.

In the event of difficulties at any time during boring operations requiring the complete withdrawal from the tunnel, the CONTRACTOR shall be allowed to withdraw, abandon the tunnel and begin a second attempt at a location approved by the ENGINEER, or at the option of the CONTRACTOR and with the approval of the ENGINEER, the CONTRACTOR may excavate at the point of the difficulty and install the ductile iron pipeline by open cut method.

The number of access pits shall be kept to a minimum and the equipment must be capable of boring the proposed length in a single bore.

After the pilot hole is completed, the CONTRACTOR shall install a swivel to the reamer and commence pullback operations. Pre-reaming of the tunnel may be necessary and is at the option of the CONTRACTOR.

Reaming diameter shall not exceed 1.4 times the diameter of the pipe being installed. When the reamer exceeds this maximum, a flowable fill or suitable grout shall be pumped into the void between the PVC or HDPE pipe and drill pilot hole displacing the drilling fluid. The flowable fill or suitable grout material and method of placement shall be approved by the ENGINEER prior to installation of pipeline.

Pullback forces shall not exceed the allowable pulling forces for the PVC or HDPE pipe. Pulled HDPE pipes shall be allowed 24 hours of stabilization prior to making tie-ins to manholes. The length of extra HDPE pipe will be at CONTRACTOR's discretion.

## MANHOLE CONNECTIONS

Pipe must be pushed into manhole 4-6 inches. Pipe above springline shall be removed to be flush with manhole inside wall. Expandable foam must be installed between the outside of the pipe to the inside of the flexible boot for the circumference of the connection. Once foam is installed concrete channel may be poured from upstream invert(s) to downstream invert. (See detail for Sanitary Manhole)

## MANHOLE ADJUSTMENT & CHANNELS

Where manholes are located outside of pavements and sidewalks, the final grade adjustments shall be made with pre—cast concrete grade adjustment rings. Grade rings shall be a minimum of 3" thick, reinforced with 2 full circles of 3/16" diameter steel reinforcing wire. Manhole casting frame and concrete adjustment rings shall be secured to the precast cone section with a minimum of four 5/8" diameter cadmiumcoated threaded studs or bolts. All joints in the assembly shall be sealed with 2 rows of butyl rope. The maximum allowable grade adjustment

using grade rings and butyl rope shall be 11 inches. The final grade adjustment for manholes located in pavements and sidewalks shall be made with brick and mortar. A maximum adjustment of 11 inches shall be placed on top of the

precast cone section. This height shall not include the height of the casting. Flow lines shall be made with concrete from the upstream invert(s) to the downstream invert. Flow lines shall be completed after the pipe connection has been made to the manhole as described in the paragraph for Manhole Connections. No precast sumps are permitted.

# CONNECTIONS TO EXISTING STRUCTURES

pipe shall be cut into the manhole.

shall be set as called for on the plans.

When a sewer is connected to an existing manhole, a hole adequate to receive the new

If the existing manhole is of brick construction, a single rowlock of brick shall be turned over the new pipe and the existing manhole brick work shall be cleaned, pointed, and given a 1/2-inch mortar coat on the outside surface.

For connections to existing precast reinforced concrete manholes, a hole shall be cored into the concrete manhole wall to receive the pipe. A rubber boot, as manufactured by "KOR-N-SEAL" or engineer approved equal shall be used to create a water tight seal.

## Closure of the manhole wall shall be made using concrete. WYES, RISERS, SERVICE CONNECTIONS, AND BUILDING LEADS

Wye fittings, joints and 6" leads proposed to be used, or stubs fitted with suitable stoppers of the same type of material and joint as specified in Section A, MATERIALS,

Wye fittings shall be oriented 45 degrees above horizontal. The wye connection shall be bedded in 6a clean crushed limestone so as to eliminate rotation of the wye. Risers shall connect to wye branches constructed as part of sewer proper and shall

#### include a 45° bend and straight pipe laid to the heights specified at the right of way line or easement line. Minimum slope for building leads shall be 1/8 inch per foot (1.00%).

<u>BULKHEADS</u> At all connections to an existing sewer or extensions thereto, a watertight bulkhead with a threaded capped or valved 1 inch diameter pipe to permit measuring infiltration shall be

provided. To be removed only after directed by engineer. Located in the first manhole upstream from the point of all connections to an existing sewer, or extension thereto, a temporary 12-inch deep sump shall be provided in the first manhole above the connection which will be filled in after successful completion of any acceptance test up to the standard fillet provided for the flow channel. A watertight

## bulkhead shall be provided on the downstream side of the sump manhole. C. TESTING

All tests shall be conducted under the supervision of the Township Engineer. No acceptance tests, excluding compaction testing, shall be conducted until the entire sewer system is constructed and has been installed for not less than 30 days. All sewer lines shall be air tested and checked for alignment. All PVC sewer pipe shall be tested for deflection. Sewer pipe 24 inches and smaller shall be air tested. Sewer pipe larger than 24 inches shall be tested by either infliltration or exfiltration and shall be tested in lengths of 1600 feet or less. A copy of all test results shall be furnished to the Township

# COMPACTION TEST

Where sanitary sewer is constructed using trench B backfill, compaction testing shall be

performed by an independent testing laboratory. Testing shall be performed at intervals of one test per layer per 75 feet of trench or as

### determined necessary by the Township Engineer. TEST FOR LEAKAGE - AIR TEST

After a manhole-to-manhole section of line has been backfilled and cleaned, it shall be plugged at each manhole with pneumatic plugs. The design of the pneumatic plugs shall be such that they will hold against the line test pressure without requiring external blocking or bracing.

There shall be three (3) hose connections to the pneumatic plug. The second hose shall

be used for continuously reading the air pressure rise in the sealed line. The third hose shall be used only for introducing low pressure air into the sealed line. There shall be a 0-30 psig gauge for reading the internal pressure of the line being tested. Calibrations from the 1-10 psig range shall be in tenths of lbs (not ounces) and

Low pressure air shall be introduced into the sealed line until the internal air pressure reaches 4.0 psig greater than the average back pressure of any ground water pressure that may be over the pipe. At least two (2) minutes shall be allowed for the air pressure to stabilize. After the stabilization period, the third hose shall be disconnected.

The portion of line being tested shall be accepted if the portion under test meets the following conditions.

## 1. DI and RCP Pipes

The time requirement for the pressure to decrease from 3.5 to 2.5 psig (greater than the average back pressure of any ground water that may be over the pipe) shall not be less than the time given in the following table.

<u>Pipe</u>	Min. Holding Time Seconds/100 ft Pipe
4-inch 6-inch 8-inch 10-inch 12-inch 15-inch 18-inch 21-inch	18 42 72 90 108 126 144 180 216

Immediately prior to the performance of the line acceptance test, the ground water level shall be determined by removing the pipe cap, blowing air through the pipe nipple into the ground so as to clear it, and then connecting a clear plastic tube to the pipe nipple. The hose shall be held vertically and a measurement of the height in feet of water shall be taken after the water stops rising in this plastic tube. The height in feet shall be divided by 2.3 to establish the lbs of pressure that will be added to all readings. For example, if the height of water is 11-1/2 ft, then the added pressure will be 5 psig. This makes the 3.5 psig to be 8.5 psig, and the 2.5 psig to be 7.5 psig. The one (1) Ib allowable drop and the timing remains the same.

#### 2. PVC Pipe and HDPE Pipe

The time requirement for the pressure to decrease from 3.5 to 3.0 psig (greater than the average back pressure of any ground water that may be over the pipe) shall be calculated as shown in the following table where 'L' equals the length of sewer to be tested in feet; however in no instance shall the holding time be less than the minimum values shown in the following table:

Pipe Size <u>(inches)</u>	Holding Time <u>(seconds)</u>	Minimum Holding Tir <u>(seconds</u>	
4-inch	0.190xL	113	
6-inch	0.427xL	170	
8-inch	0.760xL	227	
10-inch	1.187xL	283	
12-inch	1.709xL	340	
15-inch	2.671xL	425	
18-inch	3.846xL	512	

If any section of the sewer fails to meet this requirement, the Contractor shall perform a television inspection of the faulty section and repair or replace all defective materials and/or workmanship to the satisfaction of the Township Engineer. The test procedure shall be repeated until the results are acceptable.

## TELEVISION INSPECTION

Contractor.

All sanitary sewers, regardless of installation process, shall be television inspected with test results approved by the Township Engineer prior to placing the sewer into service. All courses not true to line or grade shall be dug up and relaid. Television inspection for all sanitary sewers eight (8) inches in diameter and above shall be provided by the

## DEFLECTION TESTING FOR PVC PIPE

The completed installation shall at no point have out-of-round pipe deflections greater than 5%. The Engineer shall have the option of requiring deflectometer or go—no gauging tests run prior to acceptance on pipe lines where high deflections are suspected. Pipe with deflections greater than 5% will be considered unacceptable and shall be relaid by the

Deflection of PVC pipe shall be tested by pulling a wooden pig or equivalent through the pipe. The pig shall be constructed in accordance with the following table of maximum outside diameters and shall be submitted to the Township Engineer for review before testing is initiated.

Pipe I.D.	Pig O.D.
6 inches 8 inches	5.45 inches 7.28 inches
10 inches	9.08 inches
12 inches	10.78 inches

15 inches

16.12 inches 18 inches The pig shall be drawn through the pipe from manhole to manhole. Any portion of pipe through which the pig passes freely shall be deemed to have passed the deflection test. Sections of pipe through which the pig does not pass shall be located, uncovered and the

13.20 inches

#### pipe zone bedding improved and backfilled by the Contractor. The pipe shall be retested before acceptance is granted.

TESTING FOR INFILTRATION Sewer pipe over 24 inches in diameter or for all sewer pipe diameters where the ground water level is seven (7) feet or greater above the top of the sewer pipe, shall be tested to measure the infiltration of ground water. If the measured leakage exceeds 100

gallons/inch of sewer diameter/mile of sewer/day, the Contractor shall locate the points

of excessive leakage and make the necessary repairs. In the event the line does not pass the infiltration test as stated above, the test shall

# be repeated after suitable repairs have been completed.

TEST FOR EXFILTRATION

Where the ground water provides less than a 2 ft head on the sewer, an exfiltration test shall be conducted by filling the sewer with water to a 4 ft head or 4 ft above the ground water level, whichever is greater. The allowable water loss shall be 100 gallons/inch of sewer diameter/mile of sewer/day as calculated above for infiltration.

After the sewer has been filled with water, 4 hrs time shall be allowed for water absorption by the pipe before exfiltration tests are initiated. For the purpose of establishing the 4 ft test head, the head shall be measured from the center of the sewer pipe at the midpoint of the test section length. This procedure shall

SCALE: NONE

be used for both infiltration and exfiltration tests.

NORTHVILLE TOWNSHIP DEPARTMENT OF PUBLIC SERVICES 44405 SIX MILE ROAD NORTHVILLE, MICHIGAN 48168

(248) 348 - 5820

# NORTHVILLE TOWNSHIP WATER AND SEWER MAINTENANCE FACILITY

16225 BECK ROAD NORTHVILLE, MICHIGAN 48168 (248) 348 - 5820

> STANTEC 3754 RANCHERO DRIVE

> > ANN ARBOR, MI 48108 (734) 761-1010

REVISION

**stantec.** com

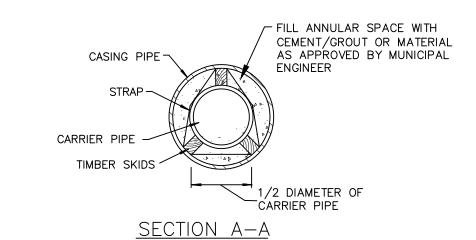
this 0-10 portion shall cover 90% of the complete dial range.

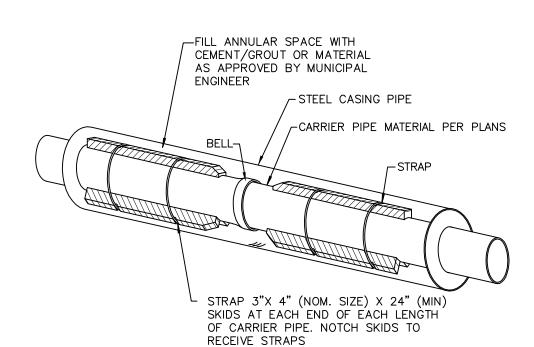
CHARTER TOWNSHIP OF NORTHVILLE

SANITARY SEWER **SPECIFICATIONS** 

### SANITARY SEWER CONSTRUCTION NOTES

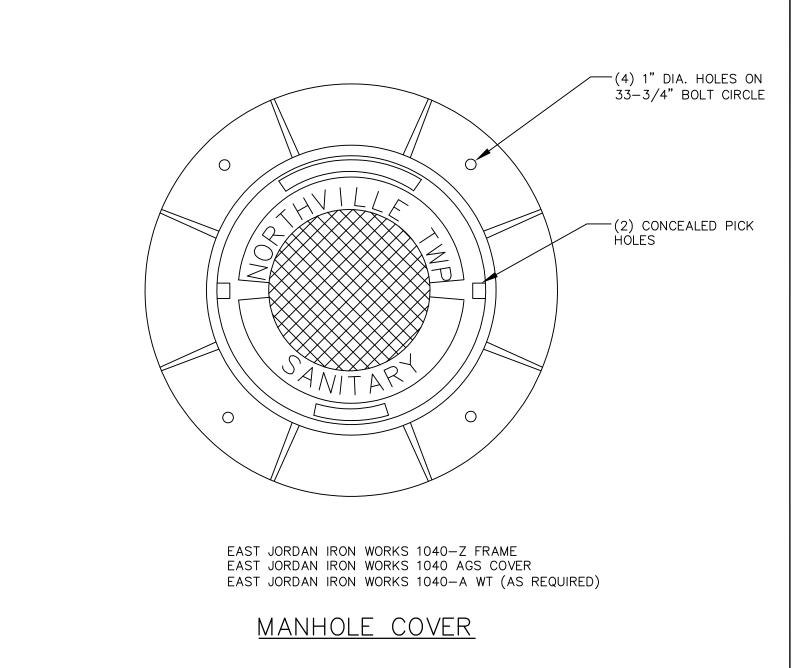
- 1. ALL WORKMANSHIP, MATERIALS, AND TESTING SHALL BE IN ACCORDANCE WITH THE CURRENT STANDARDS AND SPECIFICATIONS OF THE CHARTER TOWNSHIP OF NORTHVILLE AND THE WAYNE COUNTY DEPARTMENT OF PUBLIC SERVICES.
- 2. A PRE-CONSTRUCTION MEETING SHALL BE SCHEDULED TWO WEEKS PRIOR TO THE EXPECTED START OF CONSTRUCTION WITH THE TOWNSHIP DEPARTMENT OF PUBLIC SERVICES AND THE TOWNSHIP ENGINEER. THE CONTRACTOR SHALL CONTACT THE TOWNSHIP DEPARTMENT OF PUBLIC SERVICES TO ARRANGE THE
- 3. CONTRACTOR SHALL SUBMIT THREE (3) COPIES OF SHOP DRAWINGS TO THE TOWNSHIP ENGINEER FOR REVIEW OF COMPLIANCE WITH THE TOWNSHIP STANDARDS FOR ALL MATERIALS PROPOSED FOR CONSTRUCTION.
- 4. CONTRACTOR SHALL NOTIFY THE TOWNSHIP WATER AND SEWER DEPARTMENT AT (248) 348-5820 AND THE TOWNSHIP ENGINEER 48 HOURS PRIOR TO THE START OF CONSTRUCTION.
- 5. CONTRACTOR SHALL CALL MISS DIG AT (800) 482-7171 PRIOR TO START OF CONSTRUCTION. CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DAMAGE DONE TO ANY EXISTING UTILITY DURING CONSTRUCTION.
- 6. CONTRACTOR SHALL SCHEDULE A FINAL INSPECTION OF THE COMPLETED SEWER SYSTEM WITH THE TOWNSHIP ENGINEER AND DEPARTMENT PERSONNEL. A PUNCH LIST WILL BE SUBMITTED TO THE CONTRACTOR IN LETTER FORM, ENCLOSED WITH A LIST OF ITEMS NECESSARY FOR THE FINAL ACCEPTANCE OF THE PROJECT. ITEMS NECESSARY TO RECEIVE ACCEPTANCE INCLUDE (1) BILL OF SALE CONVEYING THE SEWER AND ALL APPURTENANCES TO THE TOWNSHIP, (2) CONSTRUCTION RECORD DRAWING, (3) A ONE YEAR MAINTENANCE BOND, (4) A FINAL WAIVER OF LIEN FROM ALL CONTRACTORS AND SUBCONTRACTORS THAT WORKED ON THE PROJECT, AND (5) CONSTRUCTION RECORD EASEMENTS (IF APPLICABLE) SIGNED ON THE CURRENT TOWNSHIP EASEMENT FORM.
- 7. NO CONNECTION RECEIVING STORM WATER, SURFACE WATER OR GROUNDWATER SHALL BE MADE TO SANITARY SEWER.
- 8. INFILTRATION FOR ANY SECTION OF SEWER BETWEEN MANHOLES SHALL NOT EXCEED 100 GALS./INCH DIA./MILE/24 HOURS.
- 9. ALL ELEVATIONS ARE BASED ON WAYNE COUNTY DATUM (USC&GS).
- 10. NO FOOTING DRAINS SHALL BE CONNECTED TO THE BUILDING SEWER.
- 11. DIFFERENTIAL OF EXCAVATION AROUND EXISTING MANHOLES SHALL NOT EXCEED SIX FEET.
- 12. CONTRACTOR SHALL NOTIFY WAYNE COUNTY DEPARTMENT OF PUBLIC SERVICES, ENGINEERING DIVISION, PERMIT OFFICE, 48 HOURS PRIOR TO START OF CONSTRUCTION. [(734) 595-6504]





# CARRIER PIPE WITH CASING PIPE

- 1. When tunneling of the utility is required it shall be in accordance with the current Wayne County Department of Public Services Requirements for Construction within Road Right of Way or Parks under Jurisdiction of the Board (Revised June 1,
- 2. The tunneling shall extend a minimum of 10 feet outside the edges of the road pavement.





		REV.	6	11/13	NOTES		
		REV.	5	01/13	MANHOLE COVI	ER	
		REV.	4	08/07	UPDATED PER	TOWNSHIP	
G		REV.	3	1/06	REVISED PER	WAYNE COUNTY COMMENTS	
ì		REV.	2	9/02	ADDED SANIT.	SEWER CONSTR. NOTES 8-13	
1		REV.	1	4/01	REVISED PIPE	STANDARDS AND ADDED BUILDING LEADS	
IES				11/96	6 ORIGINAL ISSUE:		
	J	DRAWN BY: J.L.P				CHECKED BY: T.M.M.	[



CHARTER TOWNSHIP OF NORTHVILLE

SANITARY SEWER NOTES/DETAILS



STANTEC 3754 RANCHERO DRIVE ANN ARBOR, MI 48108

Stantec (734) 761-1010

SCALE: NONE

S-2

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