

THE CITY OF HOLLAND BOARD OF PUBLIC WORKS (BPW)

SPECIFICATION FOR SANITARY SEWER COLLECTION SYSTEMS – 33 30 00

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PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes gravity sanitary sewage piping, fittings, accessories, manholes, manhole covers, manhole frames, connection of building sanitary drainage system to municipal sewers, subsequent testing of installed materials and the complete removal of abandoned pipe and appurtenances. All work shall conform to BPW Standards & Specifications and MDOT Standards & Specifications as modified by the BPW. All non-itemized work will not be paid for separately.

1.2 UNIT PRICE – MEASUREMENT AND PAYMENT

- A. Sanitary Main, PVC SDR 26, _ inch Ft
1. Paid for by the unit foot as measured in place and includes hand trimming, excavation, pipe, bedding, backfill, compaction, connection to service piping and municipal utility and testing.
- B. Sanitary Manhole, _ inch Ea
1. Paid for by the unit as measured in place and includes hand trimming, excavation, manhole, frames, covers, frame & joint seal, backfill, compaction connection to service piping and municipal utility and hand patching for HMA placement.
- C. Wye, _ inch by _ inch Ea
1. Paid for by the unit as measured in place and includes hand trimming, excavation, wye, bedding, backfill, compaction, connection to service piping and municipal utility and testing.
- D. Sanitary Lateral, PVC SDR 26, _ inch Ft
1. Paid for by the unit foot as measured in place and includes hand trimming, excavation, pipe, bedding, backfill, compaction, connection to service piping or capping at property line, connection to wye and testing.
- E. Sanitary Cleanout, PVC SDR 26, _ inch Ea
1. Paid for by the unit as measured in place and includes hand trimming, excavation, cleanout, bedding, backfill, compaction, connection to lateral, testing and cap as dictated by surface material.

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- F. Sanitary Manhole, Tap, _ inch Ea
1. Paid for by the unit as measured in place and includes hand trimming, excavation, core & boot, bedding, backfill, compaction, connection to service piping and municipal utility.
- G. Sanitary Manhole, Adjust Ea
1. Paid for by the unit as measured in place and includes hand trimming, excavation, removal of frame seal, removal of frame and cover, removal and/or replacement of adjustment rings, installation of new frame, cover and frame seal, backfill, compaction and hand patching for HMA placement.
- H. Sanitary Main, Remove Ft
1. Paid for by the unit removed and includes hand trimming, excavation, disconnection and removal of sanitary sewer mains, services and appurtenances (including manholes), backfill and compaction.

1.3 SUBMITTALS

- A. Product Data: Provide data indicating pipe, pipe accessories, castings, manhole pipe joining materials and external frame seal material for each individual manhole.
- B. Pipe Data: Provide written verifiable proof that all sewer pipe used has been manufactured by an entity with at least 5 years experience in producing the product.
- C. Manufacturer's Instructions: Indicate special construction methods required.
- D. Manufacturer's Certificate: Submit 2 copies of product ASTM certification.
- E. Project Record Documents: Record actual locations of pipe runs, wye connections from downstream manhole, manhole locations, manhole rim and invert elevations (to USGS datum) and cut depth of lateral riser. Identify and describe unexpected subsoil conditions and uncharted utilities.

1.4 COORDINATION

- A. Coordinate the Work with termination of sanitary sewer connection outside building, connection to municipal sewer utility service, and trenching.

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PART 2 - PRODUCTS

2.1 SEWER PIPE MATERIALS

- A. Sanitary Sewer Main shall conform to ANSI/ASTM D3034 SDR 26, Poly/Vinyl Chloride (PVC) material; bell and spigot style joints with elastomeric seal in accordance with ASTM D3212.
- B. Sanitary Sewer Laterals shall conform to ASTM D3034 SDR 26 and shall be push-on type with premium rubber gasket.

2.2 PIPE ACCESSORIES

- A. In-line fittings shall be same material as pipe. Saddle fittings will generally not be allowed for new pipeline construction.
- B. Connections to existing sewers shall be made using solid couplings. Fernco Strong Back RC Series Repair Couplings or BPW approved equal may be used at the discretion of the BPW.
- C. Taps into existing sewers shall be core-drilled “Kor-N-Seal Fitting”, “Fernco Saddle”, “Inserta-Tee” or BPW approved equal.

2.3 CASTINGS AND ADJUSTMENT MATERIALS

- A. Covers and Frames
 - 1. Conform to ASTM A48 Class 35B gray iron construction tar emulsion coated.
 - 2. Provide for a minimum clear opening of 24”.
 - 3. Watertight gasketed seal.
- B. Covers
 - 1. “SANITARY SEWER” cast into the top surface in 2” raised letters.
 - 2. Heavy-duty traffic rated with pick slot.
 - 3. Paved Areas: 1040AGS by East Jordan Iron Works or BPW approved equal.
 - 4. Unpaved Areas: 1040APTGS by East Jordan Iron Works or BPW approved equal. Pressure-tight, 4 hex-head ½” stainless steel watertight bolts & washers.

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C. Frames

1. Paved Areas: 1045Z by East Jordan Iron Works or BPW approved equal. Low profile frames (1046Z by East Jordan Iron Works or approved equal) may only be used at the discretion of the BPW.
2. Unpaved Areas: 1045ZPT by East Jordan Iron Works or BPW approved equal. Pressure-tight and able to receive 4 hex-head, ½” stainless steel watertight bolts and washers in a corresponding pattern with a cover.

D. Adjustment Rings

1. Height shall equal the distance between the bottom of the frame and the top of the cone section of the manhole.
2. Inside diameter shall not be less than 24”.
3. Outside diameter shall not be less than the outside diameter of the base flange of the manhole frame.
4. Contain no less than ½” and no more than 3” of rubber composite adjustment riser (Infra-Riser by East Jordan Iron Works or BPW and City of Holland approved equal) installed per manufacturer’s recommendations.
5. Additional rings shall be pre-cast concrete with 2 strands of radial steel.
6. Wherever possible, pre-cast concrete material shall be separated from iron material and other pre-cast concrete material by rubber composite adjustment risers.

E. External Frame & Joint Seal

1. Heat-shrinkable, adhesive coated sleeve with polyethylene backing compatible with concrete and iron. Sleeve shall have a peel strength of at least 8 lb/in and backing shall have a tensile strength of at least 2,900 psi. Closure material shall be used to seal overlap areas.
2. Material shall be WrapidSeal by CANUSA-CPS, Riser-Wrap by Pipeline Seal and Insulator, Inc. or BPW approved equal installed per manufacturer’s recommendations.

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2.4 MANHOLES AND CONSTRUCTION MATERIALS

- A. Mortars shall comply with MDOT Specifications. Also, no mortar mixed for more than 30 minutes shall be used. When outside temperature is equal to or less than 32 degrees F, no mortar shall be mixed without first heating the sand and water.
- B. Pipe Entrance Joints shall be flexible core and seal boot, PSX by Press-Seal Gasket Corporation or BPW approved equal.
- C. Manholes:
 - 1. Pre-cast, leak-tight units in accordance with ASTM C478 revised to include 5" wall thickness, depth as indicated.
 - 2. Cylindrical, 48" minimum clear inside diameter concentric shaft with integrally cast base.
 - 3. Eccentric cone with minimum 32" height. Concentric corbel is optional.
 - 4. External bituminous coating.
 - 5. Lipped male/female joints with synthetic gaskets according to ASTM C923
 - 6. Sleeved to receive pipe sections as required.
 - 7. Manholes shall be constructed without steps.

2.5 BEDDING MATERIAL

- A. Class I granular material conforming to MDOT Specifications.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that trench for pipe cut and excavation base for manholes are ready to receive work and excavations, dimensions, and elevations are as indicated on Drawings.

3.2 INSTALLATION - PIPE

- A. Install pipe, fittings, and accessories in accordance with MDOT specifications and manufacturer's instructions. Seal joints watertight.
- B. Lay pipe to indicated gradients with maximum variation of 1/64" in 10'.
- C. Excavation around existing manholes shall extend around entire perimeter to minimize excavation differential to 6'.

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- D. Pipe shall be installed at slopes in accordance with the most recent edition of the Recommended Standards for Wastewater Facilities (Ten States Standards).
- E. Building Connections:
 - 1. Building lead risers shall be installed at a nominal depth of 10' unless otherwise authorized by the BPW. All risers installed without building leads shall include a BPW approved plug.
 - 2. Building leads shall terminate (with approved plug) at the property line or easement line, unless otherwise noted, at a nominal depth of 10'
 - 3. Risers and/or building leads shall be marked with 2"x2"x12' hardwood markers, placed vertically at the end of the pipe, painted a fluorescent color and 2"x3/8" diameter rebar placed 1' below grade.
 - 4. Without exception, wye must be aligned with the flow in the sewer main.

3.3 INSTALLATION – MANHOLES

- A. Existing steps shall be cut flush to the inside manhole wall and patched with mortar.
- B. Lift holes shall be filled with mortar.
- C. Seal joints with external frame & joint seal.
- D. Bench and Channel
 - 1. Manholes with elevated inverts shall have bench ramped approximately 6" in height to prevent splashing erosion.
 - 2. Channels shall be constructed to create the least amount of turbulence. Any portion of the existing structure that will interfere with such construction shall be removed.
 - 3. Concrete channels formed inside precast flexible joint manholes shall be placed so as not to interfere with the flexibility of the joint. The channel shall be constructed the same size as the inside diameter of the existing pipe.
 - 4. At no time is any of the material used for constructing the bench and channel to enter the pipe. If construction material should enter the sewer, it is to be removed immediately and not allowed to continue down the sewer,
 - 5. Pipe shall not extend into a manhole beyond the inside face of the manhole wall as measured at the springline of the pipe. Field cutting of pipe to be used at manholes shall be performed in a neat and workmanlike manner. Exposed ends of reinforcing steel shall be cut flush with the pipe end.

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3.4 MANHOLE FRAME ADJUSTMENT

- A. Total height of adjustment rings may not exceed 18”.
- B. Two strips of ¾” diameter butyl rubber rope shall be placed where pre-cast concrete material contacts other pre-cast concrete material.
- C. The joint(s) under the manhole frame shall be sealed with external frame & joint seal.
- D. All surface structures outside paved areas shall be set to the plan elevation of 0.20’ above the adjacent ground.

3.5 FIELD QUALITY CONTROL

- A. Air Testing Method Procedures:
 - 1. The section of sewer to be tested shall have been trench backfilled and cleared. Pneumatic plugs (having a sealing length equal to or greater than the diameter of the pipe to be tested) placed in both ends of the pipe to be tested shall be inflated to 25 psi. The sealed sewer pipe shall then be pressurized to 4.5 psi above the average backpressure of ground water over the sewer pipe and the air pressure allowed to stabilize for at least 2 minutes.
 - 2. After the stabilization period, the line shall be pressurized to 3.5 psi above the average backpressure of ground water over the sewer pipe and the time in minutes measured for pressure to drop 0.5 psi.
 - 3. Air testing techniques shall be in accordance with the latest ASTM standard practice for testing sewer lines by low-pressure air test method for the appropriate pipe material.
 - 4. Air leakage test results shall not be less than the time per inch of pipe diameter per length of sewer pipe as specified in Table 2 of UNI-B-6-98.
- B. Deflection Testing for Flexible Thermoplastic Pipes:
 - 1. The pipeline shall be tested for excess deflecting by pulling a “go/no go” mandrel through the pipe from manhole to manhole. The mandrel shall be sized in accordance with article 4, below, and as specified in the Special Provisions. A “deflectometer” may also be used to check the record deflection. Test shall not occur sooner than 30 days after installation.
 - 2. Wherever possible and practical, the testing shall initiate at the downstream lines and proceed toward the upstream lines.

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3. Where deflection is found to be in excess of Allowable Testing Limits, the Contractor shall excavate to the point of excess deflection and carefully compact around the point where excess deflection was found. The line shall then be retested for deflection. However, should after the initial testing the deflected pipe fail to return to the original inside diameter size, the line shall be replaced back to the upstream manhole.

4. Deflection Limits for Thermoplastic Pipes:

- a. Deflection of Polyvinyl Chloride (PVC) pipe shall not exceed five percent (5%) of the "Base ID" (Internal Diameter) of the pipe. "Base ID" shall be calculated in accordance with the following:

$$\text{Average ID} = \text{Average OD} - 2(1.06)t$$

$$\text{Tolerance Package} = (A^2 + B^2 + B^2 + C^2)^{1/2}$$

Where:

A = OD Tolerance (ASTM D3034)

B = Excess Wall Thickness Tolerance = 0.06t

C = Out-of-Roundness Tolerance = 0.015(Average OD)

t = Minimum Wall Thickness (ASTM D3034)

5. Schedule mandrel testing with BPW personnel a minimum of 24 hours prior to testing.
6. The mandrel shall be hand pulled by the Contractor through the sewer lines and witnessed by BPW Personnel.
7. Any sections of the sewer not passing the mandrel test shall be uncovered. The Contractor shall, at no charge, replace and re-compact the backfill material to the satisfaction of the BPW.
8. The repaired section shall be retested with the go/no-go mandrel until it meets BPW standards and specifications.

- C. Post Sewer Construction Closed-Circuit Television (CCTV) Inspection:

1. Final inspection is required for all sanitary sewers owned and/or operated and maintained by the BPW. CCTV shall be completed and the system approved by the BPW, Utility Owner or Representative and Design Engineer before any permanent structures or pavement is placed within 15' of the installed sewers.
2. The BPW shall CCTV all public sanitary sewer lines installed. This shall be scheduled by the Contractor a minimum of 48 hours in advance.

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3. The Contractor shall make ready the sewer for CCTV by jetting the pipe and vacuuming all sand and debris.
4. The Contractor shall coordinate the inspection. CCTV shall only be performed in the presence of the Contractor, the Utility Owner or his Representative and the Design Engineer of the installed sewer. One copy of the reports and video shall be turned over to each of the above parties.
5. BPW shall bear the cost of initial CCTV for Board contracts. Contractor shall be billed for initial CCTV for non-Board contracts. BPW reserves the right to recover all costs associated with additional CCTV. The Contractor shall be billed a minimum of 2 hours of time and materials for inspections that are scheduled but unable to proceed due to unready sewer or uncoordinated inspection.
6. The reports and video will be used by the Design Engineer to evaluate the pipe for conformance with these specifications. Any non-conformance noted by the Design Engineer shall be corrected and new reports and video generated, all at the Contractor's expense.
7. The digital video files shall be recorded so that there is one line segment (manhole to manhole) per video file. The digital file shall be named with the date of recording and line segment. Paper reports shall follow in the same order as the digital files. The following information shall be recorded accurately on the reports:
 - a. Date of inspection
 - b. Video file name
 - c. Pipe size
 - d. Design Engineer or Inspector
 - e. Underground Contractor
 - f. Project name and number(s)
 - g. Municipality in which inspection is taking place
 - h. Location of recording
 - i. Upstream and downstream manhole numbers according to plans
 - j. Address of closest house and/or street name
 - k. Camera compass direction
 - l. Direction of flow
 - m. Sewer service connection wye location by station and quadrant (or clock position) including any and all connections at manholes
 - n. Defect location by station and quadrant (or clock position)
 - o. Pipe material
 - p. Original design distance between center of manholes
 - q. Type of pipe joint and length between joints
 - r. Depth from manhole rim to invert of sewer (each invert)

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3.6 PROTECTION OF FINISHED INSTALLATION

- A. Protect pipe and aggregate cover from damage or displacement until backfilling operation is in progress.
- B. If any portion of the new pipe is damaged, the pipe shall be replaced back to the nearest upstream manhole unless otherwise directed by the engineer.

3.7 METAL PIPE AND APPURTENANCE RECYCLING

- A. All removal work shall be scheduled to maintain service.
- B. Remove all sanitary sewer main, service pipe and appurtenances (including manholes) and salvage, recycle or dispose of as directed.
- C. The contractor shall transport all removed metal pipe and appurtenances to a metal recycler where they shall be weighed and credited to the BPW. Weight tickets shall be submitted for record.