

M **VILLAGE OF MATTAWAN**

Rural living at its best

**SECTION
33-34-00**

Last Revised

2008

Village of Mattawan's Construction Specifications for Sanitary
Sewer Forcemains.

**Sanitary
Forcemains**

SECTION 33 34 00

SANITARY FORCEMAINS Village of Mattawan (October 9, 2008)

PART 1 - GENERAL

1.01 SUMMARY:

- A. This Section includes work required for sanitary forcemains, structures and appurtenant work.

1.02 REFERENCES:

- A. ASTM - American Society Testing Materials, latest edition.
- B. ANSI - American National Standards Institute, latest edition.

1.03 SUBMITTALS:

- A. Submit the following for review by ENGINEER:
 - 1. Product data on Isolation Valves and Air Release Valves.
 - 2. Proposed equipment and method for Pressure and Leakage testing
- B. Report witness measurements on fittings.
 - 1. Provide measurements from three permanent fixtures such as building corners, power poles and trees 8-inch diameter and larger.
- C. Provide certification on pipe and fittings indicating conformance to specifications prior to installation.

1.04 JOB CONDITIONS:

- A. Activating New System: Notify ENGINEER after completing tests.
- B. Clean up promptly following pipe installation and within maximum of 600 feet behind pipe laying operation.

PART 2 - PRODUCTS

2.01 GENERAL:

- A. Cement Lining: ANSI A21.4 Standard thickness for ductile iron pipe and fittings.
- B. Prestressed Concrete Cylinder: Size limited to 24 inches and over.

2.02 PIPE:

- A. Ductile Iron: ANSI A21.50 and ANSI A21.51; Min. Pressure Class 350 or Class 50.

- B. Polyvinyl Chloride (PVC): ASTM D2241, PVC 1120, (SDR 26, PR-160 psi) or (SDR-21, PR 200 psi), Class 12454B.
- C. High density polyethylene (HDPE) pipe: HDPE pipe shall be made from a high density, extra high molecular weight material designated as PE3408 with an SDR of 11 or less with working pressure of at least 160 psi. ASTM D3350-83 cell class 345434C. The pipe shall meet current AWWA C906 (4-63 inches)..

2.03 JOINTS:

- A. Ductile Iron Pipe and Fittings:
 - 1. Mechanical: ANSI A21.11, Mechanical Joints.
 - 2. Push-on: ANSI A21.11.
- B. Polyvinyl Chloride (PVC) Unplasticized: Push-on rubber ring integral bell.
- C. HDPE
 - 1. Sections of polyethylene pipe shall be joined into continuous lengths on the jobsite above ground. The joining method shall be the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The butt fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements of 400 degrees Fahrenheit, alignment and an interfacial fusion pressure of 75 psi. The butt fusion jointing will produce a joint weld strength equal to or greater than the tensile strength of the pipe itself. All welds will be made using a Data Logger to record temperature, fusion pressure, with graphic representation of the fusion cycle. This log shall be part of the Quality Control records.
 - 2. Sidewall fusions for connections to outlet piping shall be performed in accordance with HDPE pipe and fitting manufacturer's specifications. The heating irons used for sidewall fusion shall have an inside diameter equal to the outside diameter of the HDPE pipe being fused. The size of the heating iron shall be ¼ inch larger than the size of the outlet branch being fused.
 - 3. Mechanical joining will be used where the butt fusion method cannot be used. Mechanical jointing will be accomplished by either using a HDPE flange adapter with Ductile Iron back-up ring or HDPE Mechanical Joint adapter with Ductile Iron back-up ring.
 - 4. Socket fusion, hot gas fusion threading, solvents and epoxies will not be used to join HDPE pipe.

2.04 FITTINGS:

- A. Ductile Iron: ANSI A21.10, ANSI 21.53, Class 54, 250 psi working pressure through 12 inch and 150 psi greater than 12 inch.
- B. Poly-vinyl Chloride Fittings (1-1/4" to 3" forcemain only): Fittings shall be PVC schedule and manufactured in compliance with ASTM D-2466. Fittings shall have a minimum pressure rating of 150 psi.

2.05 VALVES:

- A. Gate: AWWA C500, double disc, non rising stem, fully bronze mounted and roller and gear operator over 16 inches.

- B. Plug: ANSI B16,1, Clow Corporation F-5410, or equal.
- C. Air release: A.R.I. Valves D-025 or equivalent.
- D. Boxes: Three (3) section cast iron with lid marked SEWER.
 1. Upper section: Screw on adjoining center section and full diameter throughout.
 2. Center section: Minimum 5 inch inside diameter.
 3. Base section: Fit over valve bonnet and shaped round for valves through 10 inch and oval for 12 inch and over.

2.06 AIR RELEASE VALVE AND CLEANOUT CHAMBERS:

- A. Chambers shall be precast or cast-in-place concrete.
- B. Precast Units: ASTM C478 and ASTM C76, Class III.
 1. Joints: Cement mortar, preformed bituminous rope or "O"-ring gaskets.
 2. Pipe Opening: Pipe diameter plus 6 inch, maximum.
- C. Concrete: 3500 psi 28 day, 4 inch maximum slump.
- D. Concrete Brick: ASTM C55, Grade N-1.
- E. Grade Rings: ASTM C478.
- F. Mortar: ASTM C270, 1 part Portland cement, 1 part lime and 3 parts sand by volume.
- G. Chamber Steps:
 1. Plastic with $\frac{3}{8}$ inch steel reinforcement.
 2. Dimensions: 10 inch deep by 10 inch wide, 5 inch tread depth.
- H. Standard Chamber Castings: East Jordan 1045Z1 A cover or Neenah R-1642; with letter S.
- I. Watertight Chamber Castings: East Jordan 1045Z1 with watertight assembly or Neenah R-1916 F; with letter S.

2.07 MISCELLANEOUS:

- A. Plastic Seamless Encasement Tubing:
 1. Material: ASTM D1248 Polyethylene, Type I, Class C, 8 mils thick.
 2. Closing tape: 2 inch wide Poly Ken #900 or Scotchwrap #50.

C. TRACER WIRE:

- 1.. If PVC or HDPE pipe is used in this project, the CONTRACTOR shall install a 10 gauge solid copper locator wire with insulation suitable for direct burial with the force main. The locator wire shall be attached to the main at approximately 15 feet intervals with plastic cable ties. Splices shall be soldered copper-to-copper and shrink-wrapped to establish insulation across spliced length. A minimum of 6 feet of wire shall be left accessible inside structures and at marked ends. The CONTRACTOR shall be responsible for testing continuity of wire locator.

PART 3 - EXECUTION

3.01 PREPARATION:

- A. Alignment and Grade:
 - 1. Deviations: Notify ENGINEER and obtain instructions to proceed where there is a grade discrepancy or an obstruction not shown on the plans.
 - a. Verify location and depth of existing utilities in advance of construction and provide adjustments in alignment and grade of forcemain at no additional cost to OWNER.
 - 2. Depth of pipe: Minimum cover over pipe by zones:
 - a. Lower part of lower peninsula (South of the north boundary of tier of townships 20 north which is approximately highway US 10): 5 feet - 0 inches.
 - b. Upper part of lower peninsula: 5 feet - 6 inches.
 - c. Upper peninsula: 6 feet - 0 inches.
 - 3. High points in pipe line: Locate at air release valves.
 - 4. Install pipe to elevations and grades when indicated on drawings.
- B. Bedding:
 - 1. Method: Article 3.04 SCHEDULES.
 - 2. Provide bedding area backfill in accordance with SECTION 02220 EXCAVATING, BACKFILLING AND COMPACTING.
 - 3. Provide continuous bearing by supporting entire length of pipe barrel evenly.
 - 4. Bedding of carrier pipe in casing pipe shall be in accordance with SECTION 02290 BORING AND JACKING.
- C. Cleaning Pipe and Fittings:
 - 1. General: Provide interior free of foreign material and joint surfaces free of lumps and blisters.

3.02 INSTALLATION:

- A. Laying pipe:
 - 1. Place pipe length and bedding as a unit in a frost free, dry trench.
 - 2. Special supports and saddles: Article 3.04 SCHEDULES.
 - 3. Joint deflection shall be as recommended by pipe manufacturer.
- B. Cutting Pipe:
 - 1. PVC: Power saw or hand saw.
 - 2. Ductile iron: Power saw.
 - 3. Plastic: Power or hand saw.
- C. Jointing:
 - 1. Mechanical:
 - a. Lubricate with vegetable soap.
 - b. Tighten bolts evenly to 75 to 90 foot pounds.
 - 2. Push-on:
 - a. Lubricate as recommended by manufacturer.
 - b. Shape beveling as recommended by manufacturer.
 - 3. Prestressed concrete cylinder:
 - a. Lubricate with vegetable soap.
 - b. Grouting: Fill external and internal recesses and trowel inside.
 - 4. Polyethylene (PE) Plastic:
 - a. Manufacturer's equipment shall be used for fusing pipe.
 - 5. PVC: Manufacturer's standard.

D. Setting Valves and Fittings:

1. General: Article 3.04 SCHEDULES.
2. Valves: Plumb.
3. Valve boxes:
 - a. Base section: Center and plumb over operating nut and 2 inches above bonnet joint.
 - b. Upper section: Set cover flush with finished grade.
 - c. Witnesses: Provide three (3) measurements to permanent surface features.

E. Cleanout and Air Release Valve Chambers:

1. General: Article 3.04 SCHEDULES:
2. Base Bedding: Provide 4 inch pea stone with full and even bearing in impervious soils or wet conditions. Otherwise provide on undisturbed, frost-free, dry subgrade.
3. Precast: Fill joint space completely and trowel.
4. Provide casting setting as follows:
 - a. Existing pavement : Flush.
 - b. Gravel grade: 4 inches below.
 - c. Unpaved areas: Finished grade.

F. Reaction Backing:

1. Placement: Article 3.04 SCHEDULES.
 - a. Place concrete reaction backing only where needed. Place concrete manhole block next to pipe and concrete reaction backing behind. Megalugs and fitting bolts shall not be covered with concrete.

G. Pipe Joint Restraints: Provide restrained joints for the minimum lengths as follows:

PIPE RESTRAINT LENGTH REQUIRED, FEET*							
Pipe	Tees, 90°	45°	22-1/2°	11-1/4°	Dead	Reducers	
Dia.	Bends	Bends	Bends	Bends	Ends	(one size)	**
4"	23	9	5	2	57		
6"	32	13	6	3	82	43	63
8"	41	17	8	4	104	43	55
12"	58	24	12	6	149	80	120

* The lengths of restrained pipe required shown above is based on trench backfill being compacted to 95% of the maximum density according to the Modified Proctor Method. The above lengths do not consider polyethylene wrapped pipe. If the pipe is wrapped with polyethylene, the minimum lengths of restrained pipe shall be shown on the plans and approved by the TOWNSHIP ENGINEER.

** If straight run of pipe on small side of reducer exceeds this value, then no restrained joints are necessary.

G. Polyethylene Encasement:

1. In corrosive soils: Install over ductile iron pipe and tape seams in accordance with AWWA C-105.

3.03 TESTING AND INSPECTION:

- A. General:
 - 1. Observation: By ENGINEER.
 - 2. Completion: Before connection to lift station.
 - 3. Notification: Pretest and arrange with ENGINEER for inspection and test.
 - 4. Equipment and assistance: Provide.
 - 5. Required water: By OWNER where available from municipal system.
- B. Electrical Continuity: Test for continuity and repair breaks.
- C. Pressure:
 - 1. Conditions: Air or air-water methods of applying pressure prohibited.
 - 2. Range: 100 to 110 psi at lowest elevation.
 - 3. Duration: 1 hour and until completion of inspection.
 - 4. Procedure: Fill system slowly, expel air through air release valve connection at high points and apply pressure. Install air release valve after test.
 - 5. Inspection: Examine line and appurtenances for leaks and movement.
 - 6. Corrections: Repair defects, visible leaks and repeat test until acceptable.

- A. Leakage :
 - 1. Condition: Following pressure test.
 - 2. Average pressure: Within pressure test range.
 - 3. Duration: two (2) hours.
 - 4. Filling: As in pressure test.
 - 5. Supplying make-up water: Measurable source.
 - 6. Leakage: Quantity of water supplied to maintain test pressure.
 - 7. Allowable: Less than:

$$L = \frac{ND \times \text{Square root of } P}{3700}, \text{ where}$$

L = leakage (gallons per hour)
 N = number of joints
 D = nominal pipe diameter (inches)
 P = average test pressure (pounds per square inch gauge)

Note: Formula equals 0.8 gallon per hour per mile per inch diameter at 100 psi for 18 foot lengths.

- 8. Correction: Repair defects and repeat test until acceptable.

3.04 SCHEDULES:

- A. Standard Details: (See Attached)
 - 1. Methods of bedding pipe – pressure pipe.
 - 2. Standard air release valve chamber
 - 3. Drop connection detail for 1-1/4" to 3" forcemain
 - 4. Drop connection detail for 4" and larger forcemain.

END OF SECTION