

***VM* VILLAGE OF MATTAWAN**

Rural living at its best

**SECTION
33-31-00**

Last Revised

2008

Village of Mattawan's Construction Specifications for
Sanitary Sewer.

**Sanitary
Sewers**

SECTION 33 31 00

**SANITARY SEWERS
Village of Mattawan
(10/9/2008)**

PART 1 - GENERAL

1.01 SUMMARY:

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

1.02 REFERENCES:

- A. ASTM – American Society of Testing Materials, latest edition.
- B. NCPI - National Clay Pipe Institute.

1.03 DEFINITIONS:

- A. Standard manhole unit: Depth of 12 feet or less, from top of casting to lowest invert.
- B. Additional manhole depth: Depth in excess of 12 feet.

1.04 SUBMITTALS:

- A. Submit the following for review by ENGINEER:
 - 1. Test Specimens per SECTION 01 45 00 - QUALITY CONTROL.
 - 2. Proposed equipment and method for leakage testing.
 - 3. Shop drawings on radius pipe and manhole tees.
 - 4. Manufacturer's air or vacuum test results on concrete pipe.
 - 5. Manufacturer's certification of compliance with specified materials.
- B. Report the following "as-built" information to ENGINEER.
 - 1. Three (3) witness measurements to end of laterals from permanent fixtures such as building corners, power poles and trees 8-inch diameter and larger.
 - 2. Measurements from wyes or tees to nearest downstream manhole.
 - 3. Invert elevation of end of lateral.
- C. Report presence of underground utilities and drains.
- D. Line and grade control method other than Laser Beam shall be approved by ENGINEER.

1.05 JOB CONDITIONS:

- A. Maintain existing sanitary sewer system operational. At new connections to the existing sewer system, plug the downstream end of the new sewer until the new sewer has been tested and accepted.
- B. Do not bypass wastewater to ground or surface waters.

- C. Install service lines as pipe laying progresses and within maximum of 600 feet of mainline sewer installation.
- D. Clean up promptly following pipe installation and within maximum of 400 feet behind pipe laying operation. Clean-up includes backfill and rough grading.

PART 2 - PRODUCTS

2.01 PIPE:

A. Classification Table:

Type and Size	Design Depth (feet)		
	D1 0' - 10'	D2 10' - 19'	D3 Over 19'
Plastic (PVC) 8" - 15"	ASTM D3034-SDR35	ASTM D3034-SDR35	ASTM D3034-SDR26 (with SDR35 O.D.)
Plastic (PVC) 18" & larger	ASTM F679 Solid Wall	ASTM F679 Solid Wall	ASTM F679 Solid Wall
Plastic (PVC) 4" - 6"	ASTM D3034-SDR35	ASTM D3034-SDR35	ASTM D3034-SDR26 (with SDR35 O.D.)

- B. Service Pipe and Fittings: Provide minimum 6 inch, same classification as mainline pipe.
 - 1. Plastic (PVC) ASTM D3034 – SDR 35 or 26.
- C. Plastic Pipe: Provide seating marks where couplings are used for jointing.
 - 1. Joints: Provide rubber "O" ring.
- D. Joint Repair or Connecting to Existing Sewer Pipe of Different Material:
 - 2. Provide Fernco adapter coupling and stainless steel bands.
- E. Provide Joint Materials as Indicated for the following Pipes:
 - 1. Plastic (PVC): ASTM D3212 or ASTM F679 (18" & larger).

2.02 MANHOLES:

- A. Manholes shall be precast units or cast-in-place concrete.
- B. Precast Units: ASTM C76 Class III or ASTM C478 with circular reinforcement, modified for "O" ring gaskets.
 - 1. Pipe Openings: Provide flexible, watertight rubber boot using mechanically compressed flexible joint re-seal, link-seal, Pressure Wedge, Kor-N-Seal or equal. Conform to ASTM C923.
- C. Concrete: 3500 psi 28 day, 4 inch maximum slump.
- D. Concrete Brick: ASTM C55, Grade N-1.

- E. Grade Rings: ASTM C478 with “O” ring gaskets or ASTM D4976 HDPE adjusting rings with butyl sealant manufactured by Ladtech, Inc. or equal.
- F. Mortar: ASTM C270: 1 part Portland cement, 1 part lime and 3 parts sand by volume.
- G. Manhole Steps:
 - 1. Plastic with $\frac{3}{8}$ -inch steel rod reinforcement conforming to ASTM D2146, Type II.
 - 2. Dimensions: 10-inch deep by 10 inch wide, 5-inch tread depth.
 - 3. Comply with applicable Occupational Safety and Health Administration Standards (OSHA).
- H. Standard Manhole Castings: East Jordan 1045Z1 A cover or Rexus 24” Sanitary Sewer, Rex24sans – 2 hole cover; with letter S.
- I. Watertight Manhole Castings: East Jordan 1045Z1 or Pamrex, pamrex24sanitary- with watertight assembly; with letter S.
- J. Bituminous Waterproofing: ASTM D449.
- K. Cement Waterproofing: Masonry filler.
- L. Flowable Fill: See SECTION 31 23 23 – FLOWABLE FILL.

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.
 - 2. Laser Beam Control: Provide.
 - 3. Check grade: At set-up point, 25 foot, 50 foot, 100 foot and 200 foot points thereafter to the next set-up point.
 - 4. Projector advancement: Reset at each manhole.
- B. Bedding:
 - 1. Method: Article 3.05 SCHEDULES.
 - 2. Provide bedding area backfill in accordance with SECTION 31 23 33 - TRENCHING, EXCAVATING AND BACKFILLING.
 - 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 33 05 25 - BORING AND JACKING.

3.02 INSTALLATION:

- A. Laying pipe:
 - 1. Direction shall be upstream with spigot or tongue end downstream and bell end upstream.
 - 2. Joints shall be smooth and clean.
 - 3. Place pipe length and bedding as a unit in a frost free, dry trench.
 - 4. Install PVC pipe in accordance with ASTM 2321 and these specifications.
 - 5. Special supports and saddles: Article 3.05 SCHEDULES.

- B. Jointing:
 - 1. Provide solvents, adhesives and lubricants as furnished by Manufacturer.
 - 2. Gasket position: Confirm that the gasket is in place and that the joint is properly made.

- C. Manholes:
 - 1. General: Article 3.05 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. Fill joint space completely and trowel between sections of precast units.
 - 4. Provide casting grade setting as follows:
 - a. Existing pavement: Finished grade.
 - b. Gravel or lawn grade: 4 inches bellow.
 - c. Unpaved areas: Finished grade.
 - 5. Provide waterproofing on ASTM C478 units and cast-in-place manholes using one of the following methods:
 - a. Bituminous: Apply 1 gallon per 100 sq.ft. to outside free of holidays and open pin holes
 - b. Cement: Apply masonry filler to outside by brushing on two (2) coats, each minimum of 2 lbs. per sq. yd.
 - 6. Flow channels:
 - a. Construct with concrete up to spring line of pipe and slope benches toward center of manhole. Trowel smooth.
 - b. Provide clean, smooth, straight flow channels for main line and laterals.
 - c. Provide smooth curvilinear flow channels for turning flows.
 - 7. Casting adjustment: EJIW – Infra-Riser rubber composite, or HDPE ring between leveling and top course of bituminous. Match cross slope of top of casting to cross slope of pavement.
 - a. Adjusting rings:
 - 1) Install per manufacturer's recommendations.
 - 2) Seal to manhole structure, casting and to one another by means of an approved butyl sealant.
 - 3) Adjustment for matching road grade and/or cross slope shall be made utilizing a molded and indexed slope ring.
 - 8. Drop connection required for drop of 2 feet or more: ARTICLE 3.05 SCHEDULES

- D. Abandoning and filling existing sanitary sewer and manholes:
 - 1. Pipe: Plug ends of pipe to be abandoned and fill completely with flowable fill.
 - 2. Manhole: Remove top 3 feet of manhole, plug pipe openings and fill manhole to be abandoned with flowable fill.

- E. Connections:
 - 1. Expose existing sanitary sewer and structures to which the new work is to be connected to confirm condition, location and elevation.
 - 2. Connect to existing sanitary manhole by coring or jack hammering an opening adequate to insert pipe and secure circumference of pipe with non-shrink cement mortar.
 - a. Relay and repoint loose blocks and bricks on existing block and brick structures. Rechannel flowlines and benches with concrete, trowel smooth.
 - 3. Future Sanitary Sewer: Provide the following:
 - a. Plug: Pipe 4 inch through 21 inch with standard disc.
 - b. Bulkhead: Pipe 24 inch and larger with brick and mortar and ½ inch plaster coat outside.
 - (1) 24 inch - 36 inch: 4 inch thick.
 - (2) 42 inch - 60 inch: 8 inch thick.

F. Service Lines:

1. Align at right angles to street or easement line.
 2. Grade: Provide at uniform rate from mainline wye or riser to the property or easement line, at minimum grade 1/4 inch per foot.
 3. Provide minimum depth at street right-of-way line, property line or easement line as follows (based on house with 8 foot ceiling height in basement, length on private property of 100 feet, and minimum grade on private property of 1/8 inch per foot):
 - a. House with basement: 12 feet below first floor elevation or 3 feet below basement elevation, whichever is deeper.
 - b. Commercial and industrial buildings, schools, churches: As determined by ENGINEER.
 - c. The above depths govern, except that the minimum depth at the right-of-way line or property line shall be 6 feet below street or easement centerline grade unless otherwise permitted by ENGINEER.
 - d. Property line riser excluded from the above minimum depths.
 - e. The minimum depths shown above shall be increased based on actual basement ceiling height and distance away.
 4. Connection fitting:
 - a. Locate as directed by ENGINEER in field.
 - b. 45° or 60° Wyes: Provide on all pipe except concrete pipe.
 - c. Tees: Allowed only on reinforced concrete pipe.
 5. Main riser will be allowed where cover exceeds 13 feet at mainline.
 6. Plugging: Provide standard plugs or caps securely blocked.
 7. Markers: Place a wood marker (2" x 2" minimum) at end of lateral with sufficient length to extend from invert of lateral to ground surface. Attach a steel rerod 36 inches in length immediately next to the wood marker with the top of the rerod 2 inches below grade. Cover wood marker and steel rerod with 6' long 4" PVC pipe buried 3 feet.
 8. Witnesses: Report the following to the ENGINEER:
 - a. Wyes or Tees: Measurements to nearest downstream manhole.
 - b. End of Laterals: Three (3) measurements to permanent surface features and elevation.
 9. Property line Riser: Required on all laterals. See ARTICLE 3.05 SCHEDULES.
- G. Bypass Pumping: Provide temporary bypass pumping of wastewater flow as required during construction or replacement of sanitary sewer. See SECTION 01 57 20 - TEMPORARY PUMPING.
- H. Pipe Insulation: Where noted on plans, place 2-inch thick Styrofoam insulation board 4 feet wide over pipe at top of bedding.

3.03 TESTING AND INSPECTION:

A. General:

1. Observation: By ENGINEER.
2. Testing: Perform upon completion and before connecting to active system.
3. Leakage tests: Provide promptly following installation of sewer pipe including services, and keep within maximum 1200 feet behind pipe laying operation.
4. Notification: Clean, pretest and arrange with ENGINEER for final inspection and test.
5. Provide necessary equipment, manpower and assistance.
6. Manholes: See ARTICLE 3.05 SCHEDULES.
7. Video televising: Provide prior to paving.

- B. Line and Grade: Allowable drift between structures from proposed alignment will be as follows:
 - 1. Line:
 - a. Through 36 inch: 0.20 foot.
 - b. Over 36 inch: 0.40 foot.
 - 2. Grade:
 - a. Through 36 inch: 0.02 foot.
 - b. Over 36 inch: 0.05 foot.
 - c. Allowable sag between pipe joints: 5% of pipe diameter with maximum of 1-inch.
 - 3. Repair sags in excess of tolerance prior to acceptance (required only if video televising indicates a problem).
- C. Plastic pipe deformation:
 - 1. Pipe deflection will be limited to five percent (5%) of diameter.
 - 2. Pull GO, NO-GO type gauge through pipe by hand. Article 3.05 SCHEDULES.
 - 3. CONTRACTOR shall provide proof ring for GO, NO-GO gauge from the manufacturer.
 - 4. Schedule: Conduct after final backfill has been in place a minimum of thirty (30) days, and after shutdown of dewatering operation.
 - 5. Correction: Repair defects and retest until acceptable.
- D. Video Televising (See SECTION 33 01 30 – VIDEO TELEVISIONING OF SEWERS):
 - 1. CONTRACTOR shall complete video televising of new sewers prior to acceptance
 - 2. The sewers and manholes to be televised shall be cleaned completely free of debris prior to televising.
 - 3. CONTRACTOR shall provide one copy of televising in CD/DVD format to ENGINEER.
- E. Leakage Testing:
 - 1. CONTRACTOR to perform exfiltration (water or air) test unless ground water is present, in which case CONTRACTOR may opt to perform infiltration test.
 - 2. Acceptable leakage will be as follows:
 - a. Water: Less than 100 gallons per inch of pipe diameter per mile of pipe per twenty-four (24) hours.
 - b. Air: Holding time not less than that listed in table. Article 3.05 SCHEDULE.
 - 3. Correction: Repair defects and repeat test until acceptable.
 - a. Method of repairing defects shall be approved by ENGINEER.
- F. Infiltration Test (water):
 - 1. Conditions: Minimum groundwater depth 2 feet above high point of system under test.
 - 2. Procedure:
 - a. Install and maintain "V" notch weir at low end of system under test.
 - b. Leakage: Quantity of water measured by "V" notch weir.
- G. Exfiltration Test (water):
 - 1. Conditions: Determine groundwater elevation.
 - 2. Procedure:
 - a. Fill system minimum 2 feet above high point of system or 2 feet above groundwater, whichever is higher.
 - b. Leakage: Quantity of water required to maintain constant level.

- H. Exfiltration (air): Perform in accordance with NCPI Publication, "*Low Pressure Air Test for Sanitary sewers*", and in accordance with ASTM F 1417, "*Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air*".
 - 1. Condition: Determine groundwater elevation.
 - 2. Procedure:
 - a. All pressure readings are above the average groundwater head.
- 3.04 ADJUST AND CLEAN:
- A. General:
 - 1. Keep pipe and structures clean as work progresses.
- 3.05 SCHEDULES:
- A. Exfiltration Air Test Table.
 - B. Manhole Final Inspection Punch List.
 - C. Standard Details (Attached):
 - 1. Methods of bedding pipe – gravity sewer
 - 2. Standard riser details.
 - 3. Standard sanitary manhole.
 - 4. GO, NO-GO gauge for plastic pipe.

END OF SECTION

EXFILTRATION AIR TEST

TIME REQUIRED FOR LOSS OF PRESSURE FROM 3.5 PSIG TO 3.0 PSIG FOR SIZE AND LENGTH OF PIPE INDICATED FOR Q = 0.0015 (CU. FT./MIN./SQ.FT. OF INTERNAL SURFACE AREA)

Pipe Diameter (in.)	Mini-mum time (min; sec.)	Length for Min. Time (ft.)	Time for Longer length (sec.)	Specification Time for Length (L) Shown (min:sec)											
				100ft	150ft	200ft	250ft	300ft	350ft	400ft	450ft	500ft	550ft	600ft	
4	1:53	597	.190L	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:54
6	2:50	398	.427L	2:50	2:50	2:50	2:50	2:50	2:50	2:51	3:12	3:34	3:55	4:16	
8	3:47	298	.760	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42	6:20	6:58	7:36	
10	4:43	239	1.187L	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54	9:54	10:53	11:52	
12	5:40	199	1.709L	5:40	5:40	5:42	7:08	8:33	9:48	11:24	12:50	14:15	15:40	17:06	
15	7:05	159	2.671L	7:05	7:05	8:54	11:08	13:21	15:35	17:48	20:02	22:16	24:29	26:43	
18	8:30	133	3.846L	8:30	9:37	12:49	16:01	19:14	22:26	25:38	28:51	32:03	35:16	38:28	
21	9:55	114	5.235L	9:55	13:05	17:27	21:49	26:11	30:32	34:54	39:16	43:37	47:59	52:21	
24	11:20	99	6.837L	11:24	17:57	22:48	28:30	34:11	39:53	45:35	51:17	56:59	62:41	68:23	
27	12:45	88	8.653L	14:25	21:38	28:51	36:04	43:16	50:30	57:42	64:54	72:07	79:20	86:33	
30	14:10	80	10.683L	17:48	26:43	35:37	44:31	53:25	62:19	71:13	80:07	89:02	97:56	106:51	
33	15:35	72	12.926L	21:33	32:19	43:56	53:52	64:38	75:24	86:10	96:57	107:44	118:31	129:17	
36	17:00	66	15.384L	25:39	38:28	51:17	64:06	76:55	89:44	102:34	115:23	128:13	141:02	153:51	
39	18:25	61	18.054L	30:57	45:09	60:11	75:14	90:16	105:19	120:22	135:24	150:32	165:31	180:34	
42	19:50	57	20.939L	34:54	52:21	69:48	87:15	104:42	122:09	139:36	157:03	174:31	191:58	209:25	

Note: When 2 sizes of pipe are involved, the time shall be computed by the ratio of lengths involved.

Example: 400 feet of 10 inch pipe and 200 feet of 6 inch pipe

$$\text{Time} = \frac{\text{Length}(1) \times \text{Time}(1) + \text{Length}(2) \times \text{Time}(2)}{\text{Length}(1) + \text{Length}(2)} = \frac{400 \times 7:54 + 200 \times 2:50}{400 + 200}$$

$$= \frac{400 \times 474 + 200 \times 170}{400 + 200} = 373 \text{ seconds} = 6:13 \text{ (min:sec)}$$

MANHOLE FINAL INSPECTION PUNCH LIST

- Verify specification for correct casting
- Record depth of all inverts to top of casting.
- Verify chimney adjustment rings are completely cemented in place and plaster coated.
- Verify casting is centered in the opening and completely cemented in place with no voids between casting and top of chimney. (check maximum dimensions – see Manhole Detail)
- Cement lift holes and all penetrations.
- Verify pipe penetrations are properly sealed.
- Flow lines are completed and smooth with no high or low spots.
- Flow line is poured up to spring line or ½ the diameter of pipe.
- Benches sloped to flow line at 1" per foot minimum.
- All voids in walls and bottom are cemented.
- Manhole steps and bottom are clean of concrete, bituminous, dirt, debris, etc.
- Verify slope is correct from proposed upstream to down stream inverts.
- Drainage structure constructed of blocks or bricks is plaster coated inside and outside of entire structure.
- Verify catch basin sumps are clean.
- Casting has been properly adjusted prior to final top course. (check tilt to match pavement cross slope)
- Final inspection completed before final top course of asphalt is laid.

RECOMMENDED SAFETY CHECK LIST (may not be all-inclusive)

1. Use vehicle to protect yourself from traffic.
2. Use construction cones on street with traffic (4 minimum)
3. Always wear reflectorized safety vest.
4. Follow Confined Space Entry Procedures if entering a manhole.