

## SECTION 33 31 13

### SANITARY SEWER SYSTEMS

#### PART 1 GENERAL

##### 1. 1 SECTION INCLUDES

- A. Sanitary sewer drainage piping, fittings, accessories, cleanouts, and bedding.
- B. Connection of site and/or building sanitary sewer system to municipal sanitary sewer systems.

##### 1.2 RELATED REQUIREMENTS

- A. Section 31 23 33 - Excavation, Backfill, and Compaction for Utilities
- B. Section 33 39 00 – Sanitary and Storm Sewer Manhole Structures
- C. Local governing authority and code requirements
- D. Construction Drawings

##### 1.3 PUBLIC WORK

- A. Comply with the City of Centerton, AR, standard water and sewer specifications for public water and sewer lines. If conflict should be found between this section and city standards for Public Utilities, city standards shall be the priority. It shall be the Contractor's responsibility to obtain city standard water and sewer specifications and comply with the minimum requirements.

##### 1.4 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM) latest edition
  - A 74 Cast Iron Soil Pipe and Fittings
  - A 746 Ductile Iron Gravity Sewer Pipe
  - C 12 Practice for Installing Vitrified Clay Pipe Lines
  - C 14 Concrete Sewer, Storm Drain, and Culvert Pipe
  - C 76 Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
  - C 425 Compression Joints for Vitrified Clay Pipe and Fittings
  - C 443 Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets
  - C 564 Rubber Gaskets for Cast Iron Soil Pipe and Fittings
  - C 700 Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated
  - D 1785 Polyvinyl Chloride (PVC) Plastic Pipe, Schedules 40, 80, and 120
  - D 2321 Underground Installation of Flexible Thermoplastic Sewer Pipe
  - D 3034 Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings
  - F 477 Elastomeric Seals (Gaskets) for Joining Plastic Pipe
  - F 949 Polyvinyl Chloride (PVC) Pipe and Fittings

- B. American Association of State Highway and Transportation Officials (AASHTO) latest edition
  - M 252            Corrugated Polyethylene Drainage Tubing
  - M 294            Polyvinyl Chloride (PVC) Pipe and Fittings
- C. American Water Works Association (AWWA) latest edition
  - C111            Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings

## 1.5 QUALITY ASSURANCE

- A. Compaction testing will be performed in accordance Section 31 23 33
- B. Test sanitary sewer pipe system installed below grade and outside building in accordance with the following procedures:

- 1. Perform testing of manhole construction, pipe materials, joints, or other materials incorporated into construction of sanitary sewer system to determine leakage and watertightness. In event state or local code requires more stringent test, the more stringent shall apply.

### 2. Manhole Testing:

The Owner or his designated representative or Governing Agency shall determine method of testing set forth below. Method selected will be determined by depth of each manhole, groundwater level, concrete honeycombing, or other conditions which make selected test suitable for determining physical condition and watertightness of manhole.

#### 2.1 Manhole Exfiltration Testing:

Incoming and outgoing sewer lines shall be plugged and manhole filled with water up to top of poured concrete or above highest precast barrel joint. Manhole fails if water loss exceeds maximum allowable shown below:

Depth of Manhole	Maximum Allowable Water Loss
0 - 8-ft	1-in. over 5 minutes
greater than 8-ft	1/8 gal/vertical ft over 5 minutes

#### 2.2 Manhole Vacuum Testing:

Test shall be performed with suitable apparatus made for such purpose and shall draw vacuum of 10-in. of Mercury (Hg). Test passes if vacuum remains at 10-in. of Hg or drops to not less than 9-in. of Hg in 1 min.

### 3. Flexible Pipe Deflection Testing:

#### 3.1 Allowable Deflection:

Maximum allowable pipe deflection shall not exceed 5 percent of nominal inside diameter.

3.2 Mandrel:

Mandrel, go/no-go, device shall be cylindrical in shape and constructed with either 9 or 16 evenly spaced arms or prongs. Mandrels with less arms will be rejected as not sufficiently accurate. Contact length of mandrel's arms shall equal or exceed nominal inside diameter of sewer to be inspected. Critical mandrel dimensions shall carry tolerance of 0.01-in. maximum. Mandrel and necessary equipment for mandrel test shall be provided by Contractor.

3.3 Procedure:

Mandrel shall be hand-pulled through flexible pipe sewer lines no earlier than 30 days after trench has been completely backfilled and compacted. Sections of sewer not passing mandrel shall be uncovered and rebedded, rerounded, or replaced to satisfaction of the Owner or his designated representative or Governing Agency. Repaired section shall be retested.

3.4 Mandrel O.D. (outside diameter):

Outside diameter of mandrel shall be set according to the following table:

Nominal Diameter, in.	Mandrel O.D., in.
4	3.60
6	5.40
8	7.12
10	8.80
12	10.44
15	12.90
18	15.30

3.5 Contractor's Warranty:

The Owner or his designated representative or Governing Agency reserves the right to mandrel test flexible pipe sewer line before acceptance, and also prior to expiration of first year of operation. If previously accepted line fails mandrel test performed during first year of operation, defects must be corrected at Contractor's expense.

4. Air Testing of Gravity Sewers:

4.1 Procedure:

4.1.1 Plug pipe outlets with suitable test plugs and brace each plug securely.

4.1.2 Pipe air supply to pipeline to be tested in such manner that air supply may be shut off, pressure observed, and air pressure released from pipe without workmen entering manhole.

4.1.3 Add air slowly to portion of pipe under test until internal pressure of line is raised to approximately 4 psig, but less than 5 psig.

- 4.1.4 Shut air supply off and allow at least 2 minutes for air pressure to stabilize.
- 4.1.5 When pressure has stabilized and is at or above starting test pressure of 3.5 psi, start test.
- 4.1.6 Determine time in seconds with stopwatch for pressure to fall 0.5 psig so that pressure at end of time is at or above 3.0 psig.
- 4.1.7 Compare observed time with minimum allowable times in chart on following page for pass/fail determination.

1 Nominal Pipe Diameter (inches)	2 Minimum Time (min:sec.)	3 Length for Minimum Time (feet)	4 Time for Longer Length (sec.)	SPECIFICATION TIME FOR LENGTH (L) SHOWN (MIN:SEC)							
				100 ft	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft
4	1:53	597	.190L	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53
6	2:50	398	.427L	2:50	2:50	2:50	2:50	2:50	2:50	2:51	3:12
8	3:47	298	.760L	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42
10	4:43	239	1.187L	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54
12	5:40	199	1.709L	5:40	5:40	5:42	7:08	8:33	9:58	11:24	12:50
15	7:05	159	2.671L	7:05	7:05	8:54	11:08	13:2	15:3	17:48	20:02
18	8:30	133	3.846L	8:30	9:37	12:4	16:01	1	5	25:38	28:51
21	9:55	114	5.235L	9:55	13:0	9	21:49	19:1	22:2	34:54	39:16
24	11:20	99	6.837L	11:2	5	17:2	28:30	4	6	45:35	51:17
27	12:45	88	8.653L	4	17:5	7	36:04	26:1	30:3	57:42	46:54
30	14:10	80	10.683	14:2	7	22:4	44:31	1	2	71:13	80:07
33	15:35	72	L	5	21:3	8	53:52	34:1	39:5	86:10	96:57
36	17:00	66	12.926	17:4	8	28:5	64:06	1	3	102:3	115:23
			L	8	26:4	1		43:1	50:3	4	
			15.384	21:3	3	35:3		6	0		
			L	3	32:1	7		53:2	62:1		
				25:3	9	43:5		5	9		
				9	38:2	6		64:3	75:2		
					8	51:1		8	4		
						7		76:5	89:4		
								5	4		

#### 4.2 Safety Precautions:

Low pressure air test may be dangerous to personnel if, through lack of understanding or carelessness, line is overpressurized or plugs are installed improperly. It is extremely important that various plugs be installed so as to prevent the sudden expulsion of poorly inflated plug. As example of hazard, force of 250-lb is exerted on 8-in. plug by internal pressure of 5 psi. Observe following safety precautions:

4.2.1 No person shall be allowed in manholes during test or when plugged pipe is under pressure.

4.2.2 Gauges, air piping manifolds, and valves shall be located at top of ground.

4.2.3 Install and brace plugs securely.

4.2.4 Do not overpressurize lines.

4.3 Groundwater Elevation:

If pipeline to be tested is below groundwater level, starting test pressure shall be increased by 0.433 psi for each foot groundwater level is above invert of sewer pipe. In no case shall starting test pressure exceed 9.0 psig.

4.4 Acceptance of Installation:

No gravity sewer or manhole will be accepted that does not comply with minimum requirements of tests described in herein.

4.5 Test Equipment:

Necessary equipment to perform air test in accordance with Specifications shall be provided by Contractor. Test gauge shall preferably have incremental division of 0.10 psi and have accuracy of at least 0.04 psi. In no case shall test gauge be used which has incremental divisions of greater than 0.25 psi. Gauge shall be of sufficient size in order to determine this accuracy.

4.6 Furnish 1 copy of gravity sewer and manhole test results to the Owner or his designated representative and Governing Agency upon completion of gravity sewer system backfilling operations.

## 1.5 SUBMITTALS

A. Product Data: Provide data of pipe materials, pipe fittings, and accessories.

B. Manufacturer's Certificate: Certify that products meet or exceed specified local requirements.

## 1.6 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations of pipe runs, connections, cleanouts, and invert elevations.

B. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

## 1.7 PROJECT CONDITIONS

A. Coordinate work with sanitary sewer connections to structures and to municipal sewer system.

## PART 2 PRODUCTS

### 2.1 SEWER PIPE MATERIALS

- A. Sanitary sewer piping, buried **beyond 5 feet** of building
  - 1. PVC Pipe: ASTM D 2665 or ASTM D 3034
    - a. Fittings: PVC
    - b. Joints: Solvent welded, with ASTM D 2564 solvent cement.
- B. Sanitary sewer piping, buried within 5 feet of building
  - 1. PVC Pipe: ASTM D 2665 or ASTM D 3034
    - a. Fittings: PVC
    - b. Joints: Solvent welded, with ASTM D 2564 solvent cement.

### 2.2 PIPE ACCESSORIES

- A. Pipe Joints: Mechanical clamp ring type, stainless steel expanding and contracting sleeve, neoprene ribbed gasket for positive seal.
- B. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps, etc.

### 2.3 CLEANOUTS

- A. Lid and Frame: Heavy Duty cast iron construction, as manufactured by Mueller or approved equal. Lid Design: Closed Lid.
- B. Shaft Construction: Cast Iron shaft of internal diameter as indicated on Construction Drawings with 2500 psi concrete collar matching finish grade.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify items specified in other sections are properly sized and located.
- B. Verify that trench cut and excavation is ready to receive work and excavations, dimensions, and elevations are as indicated on Construction Drawings.

### 3.2 PREPARATION

- A. Hand trim excavations to required elevations. Correct overexcavation with bedding material.
- B. Remove large stones or other hard matter which could damage pipe or impede consistent backfilling or compaction.

### 3.3 BEDDING

- A. Excavate trench and place bedding material in accordance with Section 31 23 33.

### 3.4 INSTALLATION – PIPE

- A. Install pipe, fittings, and accessories in accordance with ASTM C 12, ASTM C 14, ASTM D 2321, or manufacturer's instructions and local requirements.
- B. Lay pipe to slope gradients noted on Construction Drawings.
- C. Install pipe on bedding in accordance with Section 31 23 33.
- D. Refer to Section 31 23 33 for trenching requirements. Do not displace or damage pipe when backfilling and compacting.
- E. Refer to Section 33 39 00 for manhole requirements.
- F. Connect to building sanitary sewer outlet and municipal sewer system as indicated on Construction Drawings.

### 3.5 INSTALLATION - CLEANOUTS

- A. Form bottom of excavation clean and smooth to correct elevation.
- B. Provide concrete encasement as indicated on Construction Drawings after sanitary sewer pipe and fittings have been installed to proper elevations.

END OF SECTION