

SECTION 02732

ACCEPTANCE TESTING FOR SANITARY SEWERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Acceptance testing criteria and procedures for sanitary sewers, including:
  - 1. Visual inspection of sewer pipes.
  - 2. Mandrel testing for flexible sewer pipes.
  - 3. Leakage testing of sewer pipes.
  - 4. Leakage testing of manholes.
  - 5. Smoke testing of point repairs.
  - 6. Post Cleaning and Television Inspection of rehabilitated sanitary sewer.
- B. Tests listed in this Section are not necessarily required on this Project. Required test is named in other Sections which refer to this Section for testing criteria and procedures.

1.02 UNIT PRICES

- A. No payment will be made for Acceptance Testing for Sanitary Sewers under this section. Payment for work performed as described under this section shall be included in the unit price bid for applicable work items.

1.03 PERFORMANCE REQUIREMENTS

- A. Gravity flow sanitary sewers are required to have a straight alignment and uniform grade between manholes.
- B. Flexible pipe, including “semi-rigid” pipe, is required to show no more than 5 percent deflection. Test pipe no sooner than 30 days after backfilling of a line segment but prior to final acceptance using a standard mandrel to verify that installed pipe is within specified deflection tolerances.
- C. Maximum allowable leakage for infiltration or exfiltration.

1. The total exfiltration, as determined by a hydrostatic head test, shall not exceed 50 gallons per inch diameter per mile of pipe per 24 hours at a minimum test head of 2 feet above the crown of the pipe at the upstream manhole or 2 feet above the groundwater elevation, whichever is greater.
  2. When pipes are installed more than 2 feet below the groundwater level, an infiltration test shall be used in lieu of the exfiltration test. The total infiltration shall not exceed 50 gallons per inch diameter per mile of pipe per 24 hours. Groundwater elevation must be at least 2 feet above the crown of the pipe at the upstream manhole.
  3. Refer to Table 02732-1, Water Test Allowable Leakage, at the end of this Section, for measuring leakage in sewers. Perform leakage testing to verify that leakage criteria are met.
- D. Perform air testing in accordance with requirements of this Section and the Texas Commission on Environmental Quality requirements. Refer to Table 02732-2, Time Allowed for Pressure Loss from 3.5 psig to 2.5 psig, Table 02732-3, Minimum testing Times for Low Pressure Air Test, and Table 02732-4, Vacuum Test Time Table, at the end of this Section.

#### 1.04 SUBMITTALS

- A. Submittals shall conform to all provisions and sections of these specifications.
- B. Test Plan: Before testing begins and in adequate time to obtain approval through the submittal process, prepare and submit a test plan for approval by Owner's Representative Include testing procedures, methods, equipment, and tentative schedule. Obtain advance written approval for deviations from the Drawings and Specifications.
- C. Test Reports: Submit test reports for each test on each segment of sanitary sewer within 7 days after testing on that segment as performed.

#### 1.05 GRAVITY SANITARY SEWER QUALITY ASSURANCE

- A. Remove and replace, and retest manholes or sections of pipe which fail to meet specified requirements when tested.
- B. Provide testing reports within 7 days after completion.

#### 1.06 SEQUENCING AND SCHEDULING

- A. Perform testing as work progresses. Schedule testing so that no more than 1000 linear feet of installed sewer remains untested at any one time.
- B. Coordinate testing schedules with The Owner's Representative. Perform testing under observation of the Owner's Representative.

## PART 2 PRODUCTS

### 2.01 DEFLECTION MANDREL

- A. **Mandrel Sizing.** The rigid mandrel shall have an outside diameter (O.D.) equal to 95 percent of the inside diameter (I.D.) of the pipe. The inside diameter of the pipe, for the purpose of determining the outside diameter of the mandrel, shall be the average outside diameter minus two minimum wall thicknesses for O.D. controlled pipe and the average inside diameter for I.D. controlled pipe. Dimensions shall be per appropriate standard. Statistical or other "tolerance package" shall not be considered in mandrel sizing.
- B. **Mandrel Design.** The rigid mandrel shall be constructed of a metal or a rigid plastic material that can withstand 200 psi without being deformed. The mandrel shall have nine or more "runners" or "legs" as long as the total number of legs is an odd number. The barrel section of the mandrel shall have a length of at least 75 percent of the inside diameter of the pipe. The rigid mandrel shall not have adjustable or collapsible legs which would allow reduction in mandrel diameter during testing. A proving ring shall be provided and used for verifying each size mandrel.
- C. **Proving Ring.** Furnish a "proving ring" with each mandrel. Fabricate the ring of 2-inch-thick, 3-inch-wide bar steel to a diameter 0.02-inches larger than approved mandrel diameter.
- D. **Mandrel Dimensions (5% allowance).** Average inside diameter and minimum mandrel diameter are specified in Table 02732-5, Pipe vs. Mandrel Diameter, at the end of this Section. Mandrels for higher strength, thicker wall pipe or other pipe not listed in the table may be used when approved by the Owner's Representative.

### 2.02 EXFILTRATION TEST

- A. **Test Equipment:**
  - 1. Pipe plugs.
  - 2. Pipe risers where the manhole cone is less than 2 feet above highest point in pipe or service lead.

2.03 INFILTRATION TEST

A. Test Equipment:

1. Calibrated 90° V-notch weir.
2. Pipe plugs.

2.04 LOW PRESSURE AIR TEST

A. Minimum Requirement for Equipment:

1. Control panel.
2. Low-pressure air supply connected to control panel.
3. Pneumatic plugs: Acceptable size for diameter of pipe to be tested; capable of withstanding internal test pressure without leaking or requiring external bracing.
4. Air hoses from control panel to:
  - a. Air supply
  - b. Pneumatic plugs
  - c. Sealed line for pressuring
  - d. Sealed line for monitoring internal pressure

B. Testing Pneumatic Plugs: Place a pneumatic plug in each end of a length of pipe on the ground. Pressurize plugs to 25 psig; then pressurize sealed pipe to 5 psig. Plugs are acceptable if they remain in place against the test pressure without external aids.

2.05 GROUND WATER DETERMINATION

A. Equipment: Pipe probe or small diameter casing for ground water elevation determination.

2.06 SMOKE TESTING

A. Equipment:

1. Pneumatic plugs.

2. Smoke generator as supplied by Superior Signal Company, or an approved equal.
3. Blowers producing 2500 scfm minimum.

### PART 3 EXECUTION

#### 3.01 PREPARATION

- A. Provide labor, equipment, tools, test plugs, risers, air compressor, air hose, pressure meters, pipe probe, calibrated weirs, or any other device necessary for proper testing and inspection.
- B. The selection of test methods and pressures for gravity sanitary sewers shall be determined based on ground water elevation. Determine ground water elevation using equipment and procedures conforming to Section 01563-Control of Ground Water and Surface Water.

#### 3.02 VISUAL INSPECTION OF GRAVITY SANITARY SEWERS

- A. Check pipe alignment visually by flashing a light between structures. Verify if alignment is true and no pipes are misplaced. In case of misalignment or damaged pipe, remove and re-lay or replace pipe segment.

#### 3.03 MANDREL TESTING FOR GRAVITY SANITARY SEWERS

- A. Perform deflection testing on flexible and semi-rigid pipe to confirm pipe has no more than 5 percent deflection. Mandrel testing shall conform to ASTM D 3034. Perform testing no sooner than 30 days after backfilling of line segment, but prior to final acceptance testing of the line segment.
- B. Pull the approved mandrel by hand through sewer sections. Replace any section of sewer not passing the mandrel. Mandrel testing is not required for stubs.
- C. Retest repaired or replaced sewer sections.

#### 3.04 LEAKAGE TESTING FOR GRAVITY SANITARY SEWERS

- A. Test Options:
  1. Test gravity sanitary sewer pipes for leakage by either exfiltration or infiltration methods, as appropriate, or with low pressure air testing.

2. Test new or rehabilitated sanitary sewer manholes with water or low-pressure air. Manholes tested with low-pressure air shall undergo a physical inspection prior to testing.
  3. Leakage testing shall be performed after backfilling of a line segment, and prior to tie-in of service connections.
  4. If no installed piezometer is within 500 feet of the sewer segment, Contractor shall provide a temporary piezometer for this purpose.
- B. Compensating for Ground Water Pressure:
1. Where ground water exists, install a pipe nipple at the same time sewer line is placed. Use a ½ - inch capped pipe nipple approximately 10 inches long. Make the installation through manhole wall on top of the sewer line where line enters manhole.
  2. Immediately before performing line acceptance test, remove cap, clear pipe nipple with air pressure, and connect a clear plastic tube to nipple. Support tube vertically and allow water to rise in the tube. After water stops rising, measure height in feet of water over invert of the pipe. Divide this height by 2.3 feet/psi to determine the ground water pressure to be used in line testing.
- C. Exfiltration test:
1. Determine ground water elevation.
  2. Plug sewer in downstream manhole.
  3. Plug incoming pipes in upstream manhole.
  4. Install riser pipe in outgoing pipe of upstream manhole if highest point in service lead (house service) is less than 2 feet below bottom of manhole cone.
  5. Fill sewer pipe and manhole or pipe riser, if used, with water to a point 2-1/2 feet above highest point in sewer pipe, house lead, or ground water table, whichever is highest.
  6. Allow water to stabilize for one to two hours. Take water level reading to determine drop of water surface, in inches, over a one-hour period, and calculate water loss (1 inch of water in 4 feet diameter manhole equals 8.22 gallons) or measure the quantity of water required to keep water at same level. Loss shall not exceed that calculated from allowable leakage according to Table 02732-1 at the end of this section.

- D. Infiltration test: Ground water elevation must be not less than 2.0 feet above highest point of sewer pipe or service lead (house service).
1. Determine ground water elevation.
  2. Plug incoming pipes in upstream manhole.
  3. Insert calibrated 90° V-notch weir in pipe on downstream manhole.
  4. Allow water to rise and flow over weir until it stabilizes.
  5. Take five readings of accumulated volume over a period of 2 hours and use average for infiltration. The average must not exceed that calculated for 2 hours from allowable leakage according to the Table 02732-1 at the end of this Section.
- E. Low Air Pressure Test: When using this test conform to ASTM C 828, ASTM C 924, or ASTM F 1417, as applicable, with holding time not less than that listed in Table 02732-2.
1. Air testing for sections of pipe shall be limited to lines less than 36-inch average inside diameter.
  2. Lines 36-inch average inside diameter and larger shall be “joint” tested at each joint. The minimum time allowable for the pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch during a joint test shall be 10 seconds, regardless of pipe size. “Joint Test” shall be conducted as follows:
    - a. Each joint shall be tested successfully.
    - b. Joint Tester shall be set over joint to be tested so that the two inflation tubes straddle the joint.
    - c. Inflate “inflation tubes” to 25 psig to seal off joint to be tested.
    - d. Apply air pressure into void between inflation tubes until pressure reaches 4 psig.
    - e. After pressure has stabilized, bleed air pressure back to 3.5 psig.
    - f. Record time required for pressure to drop from 3.5 psig to 2.5 psig.
    - g. If the time in seconds for the air pressure to decrease from 3.5 psig to 2.5 psig is greater than 10 seconds, the joint shall be presumed to be free from defect. When the time is less than 10 seconds pipe breakage,

joint leakage or leaking tester seals are indicated and an inspection must be made to determine the cause. The contractor shall effect such repairs as may be required to accomplish a successful air joint test.

- h. The joint shall be air tested before the pipe has been backfilled. Air testing shall be performed as pipe installation progresses.

3. For pipe sections less than 36-inch average inside diameter:

- a. Determine ground water level.
- b. Plug both ends of pipe. For concrete pipe, flood pipe and allow 2 hours to saturate concrete. Then drain and plug concrete pipe.
- c. After a manhole-to-manhole section of sanitary sewer main has been sliplined and prior to any service lines being connected to new liner, plug liner at each manhole with pneumatic plugs.
- d. Pressurize pipe to 4.0 psig. Increase pressure 1.0 psi for each 2.3 feet of ground water over highest point in the system. Allow pressure to stabilize for 2 to 4 minutes. Adjust pressure to start at 3.5 psig (plus adjustment for ground water table). See Table 02732-2 at the end of this Section.
- e. To determine air loss, measure the time interval for pressure to drop to 2.5 psig. The time must exceed that listed in the Table 02732-2 at the end of this Section for pipe diameter and length. For sliplining, use diameter of carrier pipe.

- F. Retest: Any section of pipe which fails to meet requirements shall be repaired and retested.

### 3.05 TEST CRITERIA TABLES

- A. Exfiltration and Infiltration Water Tests: Refer to Table 02732-1, Water Test Allowable Leakage, at the end of this Section.
- B. Low Pressure Air Test:
  - 1. Times in Table 02732-2, Time Allowed for Pressure Loss From 3.5 psig to 2.5 psig, at the end of this Section, are based on the equation from Texas Commission on Environmental Quality (TCEQ) Design Criteria 317.2(a)(4)(B).



$$T = 0.0850 (D) (K) / (Q)$$

where:

- T = time for pressure to drop 1.0 pounds per square inch gauge in seconds
- K = 0.000419 DL, but not less than 1.0
- D = average inside diameter in inches
- L = length of line of same pipe size in feet
- Q = rate of loss, 0.0015 ft<sup>3</sup>/min./sq. ft. internal surface

2. Since a K value of less than 1.0 shall not be used, there are minimum testing times for each pipe diameter as given in Table 02732-3, Minimum Testing Times for Low Pressure Air Test.
3. Notes:
  - (a). When two sizes of pipe are involved, the time shall be computed by the ratio of lengths involved.
  - (b). Lines with 27-inch average inside diameter and larger may be air tested at each joint.
  - (c). Line with an average inside diameter greater than 36 inches must be air tested for leakage at each joint.
  - (d). If the joint test is used, a visual inspection of the joint shall be performed immediately after testing.
  - (e). For joint test, the pipe is to be pressurized to 3.5 psi greater than the pressure exerted by groundwater above the pipe. Once the pressure has stabilized, the minimum times allowable for the pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch gauge shall be 10 seconds.

### 3.06 LEAKAGE TESTING FOR MANHOLES

- A. After completion of manhole construction, wall sealing, or rehabilitation, but prior to backfilling, test manholes for water tightness using hydrostatic or vacuum testing procedures.
- B. Plug influent and effluent lines, including service lines, with suitably sized pneumatic or mechanical plugs. Ensure plugs are properly rated for pressures required for test; follow manufacturer's safety and installation recommendations. Place plugs a minimum of 6 inches outside of manhole walls. Brace inverts to prevent lines from being dislodged if lines entering manhole have not been backfilled.
- C. Vacuum Testing:
  - 1. Install vacuum tester head assembly at top access point of manhole and adjust proper seal on straight top section of manhole structure. Following manufacturer's instructions and safety precautions, inflate sealing element to the recommended maximum inflation pressure; do not overinflate.
  - 2. Evacuate manhole with vacuum pump to 10 inches mercury (Hg), disconnect pump, and monitor vacuum for the time period specified in Table 02732-4, Vacuum Test Time Table.
  - 3. If the drop in vacuum exceeds 1 inch Hg over the specified time period tabulated above, locate leaks, complete repairs necessary to seal manhole and repeat test procedure until satisfactory results are obtained.
- D. Hydrostatic Exfiltration Testing: Hydrostatic exfiltration testing shall be performed as follows:
  - 1. Seal wastewater lines coming into the manhole with an internal pipe plug. Then, fill the manhole with water and maintain it full for at least one hour.
  - 2. The maximum leakage for hydrostatic testing shall be 0.025 gallons per foot of manhole diameter per foot of manhole depth per hour.
  - 3. If water loss exceeds amount tabulated above, locate leaks, complete repairs necessary to seal manhole and repeat test procedure until satisfactory results are obtained.

### 3.07 SMOKE TEST PROCEDURE FOR POINT REPAIRS

- A. Application: Perform smoke test to:
  - 1. Locate points of line failure for point repair.

2. Determine if point repairs are properly made.
  3. Determine if service connections have been reconnected to the rehabilitated sewer.
  4. Check integrity of connections to newly replaced service taps to liners and to existing private service connections.
- B. Limitations: Do not backfill service taps until completion of this test. Test only those taps in a single manhole section at any one time. Keep the number of open excavations to a minimum.
- C. Preparation: Prior to smoke testing, give written notice to area residents no fewer than 2 days, nor more than 7 days, prior to proposed testing. Also give notice to City's Police and Fire Departments 24 hours prior to actual smoke testing.
- D. Isolate Section: Isolate manhole section to be tested from adjacent manhole sections to keep smoke localized. Temporarily seal the annular space at manhole for sliplined sections.
- E. Smoke Introduction:
1. Operate equipment according to manufacturer's recommendation and as approved by Owner's Representative.
  2. Conduct test by forcing smoke from smoke generators through sanitary sewer main and service connections. Operate smoke generators for a minimum of 5 minutes.
  3. Introduce smoke into upstream and downstream manholes as appropriate. Monitor the tap/connection for smoke leaks. Note sources of leaks.
- F. Repair and Retest: Repair and replace any taps or connections noted as leaking and then retest. Taps and connections may be left exposed in only one manhole section at a time. If repair or replacement, testing or retesting, and backfilling of the excavation is not completed within one workday, properly barricade and cover each excavation as approved by Owner's Representative.
- G. Service Connections: On houses where smoke does not issue from plumbing vent stacks to confirm reconnection of sewer service to the newly installed liner pipe, perform a dye test to confirm reconnection. Introduce dye into the service line through a plumbing fixture inside the structure or a sewer cleanout immediately outside the structure and flush with water. Observe flow at service reconnection or downstream manhole. Detection of dye confirms a reconnection.

TABLE 02732-1  
WATER TEST ALLOWABLE LEAKAGE

DIAMETER OF RISER OR STACK IN INCHES	VOLUME PER INCH OF DEPTH		ALLOWANCE LEAKAGE*	
	Inch	Gallons	Pipe Size in Inches	Gallon/Minute per 100 Ft.
1	0.7854	.0034	6	0.0039
2	3.1416	.0136	8	0.0053
2.5	4.9087	.0212	10	0.0066
3	7.0686	.0306	12	0.0079
4	12.5664	.0306	15	0.0099
5	19.6350	.0544	18	0.0118
6	28.2743	.1224	21	0.0138
8	50.2655	.2176	24	0.0158
			27	0.0177
			30	0.0197
			36	0.0237
			42	0.0276
For other diameters, multiply square of diameters by value for 1" diameter.			Equivalent to 50 gallons per inch of inside diameter per mile per 24 hours.	

\* Allowable leakage rate shall be reduced to 10 gallons per inch of inside diameter per mile per 24 hours, when sewer is identified as located within the 25-year flood plain

**ACCEPTANCE TESTING**

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TABLE 02732-2

TIME ALLOWED FOR PRESSURE LOSS FROM 3.5 PSIG TO 2.5 PSIG

Pipe Diameter (in)	Minimum Time (min. sec)	Length for Minimum Time (ft)	Time for Longer Length (sec/ft)	Specification Time for Length (L) Shown (min. sec)											
				100 ft.	150 ft	200 ft	250 ft	300 ft	350 ft	400 ft	450 ft	500 ft	550 ft	600 ft	
6	5:40	398	0.8548	5:40	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:25	7:07	7:50	8:33
8	7:33	298	1.5196	7:33	7:33	7:33	7:33	7:36	8:52	10:08	11:24	12:40	13:56	15:12	
10	9:27	239	2.3743	9:27	9:27	9:27	9:54	11:52	13:51	15:50	17:48	19:47	21:46	23:45	
12	11:20	199	3.4190	11:20	11:20	11:20	14:15	17:06	19:57	22:48	25:39	28:30	31:20	34:11	
15	14:10	159	5.3423	14:10	14:10	17:48	22:16	26:43	31:10	35:37	40:04	44:31	48:58	53:25	
18	17:00	133	7.6928	17:00	19:14	25:39	32:03	38:28	44:52	51:17	57:42	64:06	70:31	76:56	
21	19:50	114	10.4708	19:50	26:11	34:54	43:38	52:21	61:05	69:48	78:32	87:15	95:59	104:42	
24	22:40	99	13.6762	22:48	34:11	45:35	56:59	68:23	79:47	91:10	102:34	113:58	125:22	136:46	
27	25:30	88	17.3089	28:51	43:16	57:42	72:07	86:33	100:58	115:24	129:49	144:14	158:40	173:05	
30	28:20	80	21.3690	35:37	53:25	71:14	89:02	106:51	124:39	142:28	160:16	178:05	195:53	213:41	
33	31:10	72	25.8565	43:06	64:38	86:11	107:44	129:17	150:50	172:23	193:55	215:28	237:01	258:34	

TABLE 02732-3

## MINIMUM TESTING TIMES FOR LOW PRESSURE AIR TEST

PIPE DIAMETER (inches)	MINIMUM TIME (seconds)	LENGTH FOR MINIMUM TIME (feet)	TIME FOR LONGER LENGTH (seconds)
6	340	398	0.855 (L)
8	454	298	1.520 (L)
10	567	239	2.374 (L)
12	680	199	3.419 (L)
15	850	159	5.342 (L)
18	1020	133	7.693 (L)
21	1190	114	10.471 (L)
24	1360	100	13.676 (L)
27	1530	88	17.309 (L)
30	1700	80	21.369 (L)
33	1870	72	25.856 (L)

TABLE 02732-4  
 VACUUM TEST TIME TABLE

DEPTH IN FEET	TIME IN SECONDS BY PIPE DIAMETER		
	48"	60"	72"
4	10	13	16
8	20	26	32
12	30	39	48
16	40	52	64
20	50	65	80
24	60	78	96
*(T)*	5.0	6.5	8.0
* Add T times for each additional 2-foot depth. (The values listed above have been extrapolated from ASTM C 924-85)			

**ACCEPTANCE TESTING**

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TABLE 02732-5

PIPE VS. MANDREL DIAMETER

Material and Wall Construction	Nominal Size(Inches)	Average I.D. (Inches)	Minimum Mandrel Diameter
PVC-Solid (SDR 26)	6	5.764	5.476
	8	7.715	7.329
	10	9.646	9.162
PVC-Solid (SDR 35)	12	11.737	11.150
	15	14.374	13.655
	18	17.629	16.748
	21	20.783	19.744
	24	23.381	22.120
	27	26.351	25.033
PVC-Truss	8	7.750	7.363
	10	9.750	9.263
	12	11.790	11.201
	15	14.770	14.032
PVC-Profile (ASTM F 794)	12	11.740	11.153
	15	14.370	13.652
	18	17.650	16.768
	21	20.750	19.713
	24	23.500	22.325
	27	26.500	25.175
	30	29.500	28.025
	36	35.500	33.725
	42	41.500	39.425
HDPE-Profile	18	18.000	17.100
	21	21.000	19.950
	24	24.000	22.800
	27	27.000	25.650
	30	30.000	28.500
	36	36.000	34.200
	42	42.000	39.900
	48	48.000	45.600
	54	54.000	51.300
Fiberglass-Centrifugally Cast (Class SN	12	12.85	11.822
	18	18.66	17.727
	20	20.68	19.646
	24	24.72	23.484
	30	30.68	29.146
	36	36.74	34.903
	42	42.70	40.565
	48	48.76	46.322
	54	54.82	52.079
	60	60.38	57.361



**Mandrel Test Data Sheet**  
**City of Galveston, Texas**

Date: \_\_\_\_\_ Project: \_\_\_\_\_

Material: \_\_\_\_\_ Sheet #: \_\_\_\_\_ Max Allowed Deflection: \_\_\_\_\_

Upstream MH Sta. #	Downstream MH Sta. #	Pipe Dia. (inches)	Length (feet)	Pass or Fail

Inspector: \_\_\_\_\_ Date: \_\_\_\_\_  
(Signature)

Contractor: \_\_\_\_\_ Date: \_\_\_\_\_  
(Signature)

**ACCEPTANCE TESTING**

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**FOR SANITARY SEWERS**

PIPE VS. MANDREL DIAMETER

Material and Wall Construction	Nominal Size (Inches)	Average I.D> (Inches)	Minimum Mandrel Diameter (Inches)
PVC-Solid (SDR 26)	6	5.764	5.476
	8	7.715	7.329
	10	9.646	9.162
PVC-SOLID (SDR 35)	12	11.737	11.150
	15	14.374	13.655
	18	17.629	16.748
	21	20.783	19.744
	24	23.381	22.120
	27	26.351	25.033
PVC-Truss	8	7.750	7.363
	10	9.750	9.263
	12	11.790	11.201
	15	14.770	14.032
PVC-Profile (ASTM F 794)	12	11.740	11.153
	15	14.370	13.652
	18	17.650	16.768
	21	20.750	19.713
	24	23.500	22.325
	27	26.500	25.175
	30	29.500	28.025
	36	35.500	33.725
	42	41.500	39.425
HDPE-Profile	18	18.000	17.100
	21	21.000	19.950
	24	24.000	22.800
	27	27.000	25.650
	30	30.000	28.500
	36	36.000	34.200
	42	42.000	39.900
	48	48.000	45.600
	60	60.000	57.000

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Fiberglass-Centrifugally	12	12.850	11.822
	18	18.660	17.727
	20	20.680	19.646
	24	24.720	23.484
	30	30.680	29.146
	36	36.740	34.903
	42	42.700	40.565
	48	48.760	46.322
	54	54.820	52.079
60	60.380	57.361	

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*THE CITY OF GALVESTON*

**FOR SANITARY SEWERS**

**Leakage Testing for Sanitary Sewer Lines  
City of Galveston, Texas**

Project: \_\_\_\_\_ Sheet #: \_\_\_\_\_ Location: \_\_\_\_\_  
Inspector: \_\_\_\_\_ Date: \_\_\_\_\_ Contractor: \_\_\_\_\_

**Line Test Log**

Test #	Manhole UP	Manhole Down	Line Length	Line Diameter	Avg. Depth of Line	Avg. Depth of Ground-water	Start Air Pressure	End Air Pressure	Time Elapsed	Time Allowed (per table*)	Pass or Fail	Inspector	Contractor
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													

**ACCEPTANCE TESTING**

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**FOR SANITARY SEWERS**

**TIME ALLOWED FOR PRESSURE LOSS FROM 3.5 PSIG TO 2.5 PSIG**

Pipe Dia. (in)	Min. Time (min. sec.)	Length for Min. Time (ft)	Time for Longer Length (sec/ft)	Specification Time for Length (L) Shown (min. sec.)											
				100 ft.	150 ft.	200 ft.	250 ft.	300 ft.	350 ft.	400 ft.	450 ft.	500 ft.	550 ft.	600 ft.	
6	5:40	398	0.8548	5:40	5:40	5:40	5:40	5:40	5:40	5:40	5:42	6:25	7:07	7:50	8:33
8	7:33	298	1.5196	7:33	7:33	7:33	7:33	7:36	8:52	10:08	11:24	12:40	13:56	15:12	
10	9:27	239	2.3743	9:27	9:27	9:27	9:54	11:52	13:51	15:50	17:48	19:47	21:46	23:45	
12	11:20	199	3.419	11:20	11:20	11:20	14:15	17:06	19:57	22:48	25:39	28:30	31:20	34:11	
15	14:10	157	5.3423	14:10	14:10	17:48	22:16	26:43	31:10	35:37	40:04	44:31	48:58	53:25	
18	17:00	133	7.6928	17:00	19:14	25:39	32:03	38:28	44:52	51:17	57:42	64:06	70:31	76:56	
21	19:50	114	10.7408	19:50	26:11	34:54	43:38	52:21	61:05	69:48	78:32	87:15	95:59	104:42	
24	22:40	99	13.6762	22:48	34:11	45:35	56:59	68:23	79:47	91:10	102:34	113:58	125:22	136:46	
27	25:30	88	17.3089	28:51	43:16	57:42	72:07	86:33	100:58	115:24	129:49	144:14	158:40	173:05	
30	28:20	80	21.369	35:37	53:25	71:14	89:02	106:51	124:39	142:28	160:16	178:05	195:53	213:41	
33	31:10	72	25.8565	43:06	64:38	86:11	107:44	129:17	150:50	172:23	193:55	215:28	237:01	258:34	

END OF SECTION