ITEM NO. 849
Sanitary Sewer Acceptance Testing

849.1 DESCRIPTION: This item shall consist of air and deflection tests in accordance with this specification and as directed by the Engineer.

849.2 REFERENCED STANDARDS: Reference standards cited in this Specification Item No. 849 refer to the current reference standard published at the time of the latest revision date logged at the end of this Specification Item No. 849, unless a date is specifically cited.

1. San Antonio Water System (SAWS):
   a. Specifications for Water and Sanitary Sewer Construction
   b. SAWS Materials Specifications
2. City of San Antonio (COSA) Standard Specification for Construction
3. Texas Commission of Environmental Quality (TCEQ)
   a 217 Design Criteria for Domestic Wastewater Systems
4. American Society for Testing and Materials (ASTM) International:
   a. ASTM C 828 - Standard Test Method for Low Pressure Air Test of Vitrified Clay Pipe Lines.
   b. ASTM C 924 - Standard Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Air Test Method.
   c. ASTM D 3034 - Standard Specification for Type PSM Polyethylene (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
   d. ASTM F 794 - Specification for Poly (Vinyl Chloride) (PVC) Profile Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter.
   e. ASTM F 1417 - Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low Pressure Air.
   f. ASTM C 1244 Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill.

849.3 SUBMITTALS: Contractor shall submit manufacturer's product data instructions, recommendations, shop drawings, and certifications.

1. Test Plan: Before testing begins and in adequate time to obtain approval through submittal process, prepare and submit test plan for approval by SAWS Engineer.
2. Include testing procedures, methods, equipment, and tentative schedule. Obtain advance written approval for deviations from Drawings and Specifications.
3. Submit test reports for each test on each segment of sanitary sewer.

849.4 MATERIALS: The materials installed for air and deflection tests shall conform to the appropriate specifications contained within the latest revision of SAWS' Material

Specifications.

849.5 TESTING OF INSTALLED PIPE: The Contractor shall perform a low-pressure air test, or an infiltration/exfiltration test, and a mandrel test before the installed work shall be considered accepted.

1. If a gravity collection main is composed of flexible pipe, a deflection test will also be required.
2. Flexible pipe is defined as pipe that will deflect at least 2% without structural distress.
3. Contractor shall insure that all testing is performed in the presence of the Inspector, with copies of all written test results made available to the Inspector.
4. Tests shall conform to the following requirements:
    1. Low-Pressure Air Test: The procedure for the low-pressure air test shall conform to the procedures described in ASTM C828, ASTM C924, and ASTM F1417 (or other appropriate procedures), except for testing times.
        i. The test times shall be as outlined in this section. For sections of pipe less than 36-inch average inside diameter, the following procedure shall apply.
        ii. The pipe shall be pressurized to 3.5 psi greater than the pressure exerted by groundwater above the pipe.
        iii. Once the pressure is stabilized, the minimum time allowable for the pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch gauge shall be computed from the following equation:

$$T = \frac{0.085 \times D \times K}{Q}$$

T = Time for pressure to drop 1.0 pound per square inch gauge in seconds;
K = 0.000419xDxL, but not less than 1.0;
D = Average inside pipe diameter, in inches;
L = Length of line of same pipe size being tested, in feet;
Q = Rate of loss, 0.0015 cubic feet per minute per square foot internal surface shall be used since a K value of less than 1.0 shall not be used.

The minimum testing times for each pipe diameter is as follows in Table 1:

Table 1 Minimum Testing Times

Pipe Diameter	Minimum Time	Length for Minimum Time	Time for Longer Length
Inches	**Seconds**	**Feet**	**Seconds/Ft**
6	340	398	0.855
8	454	298	1.520
10	567	239	2.374
12	680	199	3.419
15	850	159	5.342
18	1,020	133	7.693
21	1,190	114	10.471
24	1,360	100	13.676
27	1,530	88	17.309
30	1,700	80	21.369
33	1,870	72	25.856

* Note: Test time starts after the required 60 seconds of stabilization time has transpired.

2. The test may be stopped if no pressure loss has occurred during the first 25% of the calculated testing time.
3. If any pressure loss or leakage has occurred during the first 25% of the testing period, then the test shall continue for the entire test duration as outlined above or until failure.

5. Mains with a 36 inch average inside diameter and larger must be air tested at each joint.
6. If the joint test is used, a visual inspection of the joint shall be performed immediately after testing.
7. The pipe is to be pressurized to 3.5 psi greater than the pressure exerted by groundwater above the pipe.
8. Once the pressure has stabilized, the minimum time 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.
9. Deflection Testing: As stated in the 30 TAC § 217, deflection test shall be

performed on all flexible pipe installed.

a. For mains with inside diameters less than 36 inches, a rigid mandrel shall be used to measure deflection.
b. For main with an inside diameter 36 inches and greater, a method approved by the Engineer shall be used to test for vertical deflections.
c. For rigid pipe, stick deflection test maybe accepted. Stick deflection test must be approved by Engineer or Inspector prior to testing.
d. The deflection test must be accurate to within $\pm$ 0.2% deflection.
    i. The test shall be conducted after the final backfill has been in place at least 30 days.
    ii. No pipe shall exceed a deflection of five percent.
    iii. If a pipe should fail to pass the deflection test, the problem shall be corrected and a second test shall be conducted after the failed area's final backfill has been in place an additional 30 days.
    iv. The tests shall be performed without mechanical pulling devices.
    v. The Engineer should recognize that this is a maximum deflection criterion for all pipes and a deflection test less than 5 % may be more appropriate for specific types and sizes of pipe.
    vi. Upon completion of construction, the Engineer or other Texas Registered Professional Engineer appointed by the owner shall certify to the Inspector, that the entire installation has passed the deflection test.
    vii. This certification may be made in conjunction with the notice of completion required in 30 TAC § 217.14. (1) of this title (relating to General Provisions).
    viii. This certification shall be provided for the Owner to consider the requirements of the approval have been met.

10. Contractor shall provide 24 hr. notice to Engineer and Inspector prior to any testing.
11. SAWS Engineer must witness all test over the EARZ.
12. Mandrel Sizing. The rigid mandrel shall have an outside diameter (O.D.) not less than 95% of the inside diameter (I.D.) of the pipe.
13. 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. All dimensions shall be per appropriate

standard. Statistical or other "tolerance packages" shall not be considered in mandrel sizing.

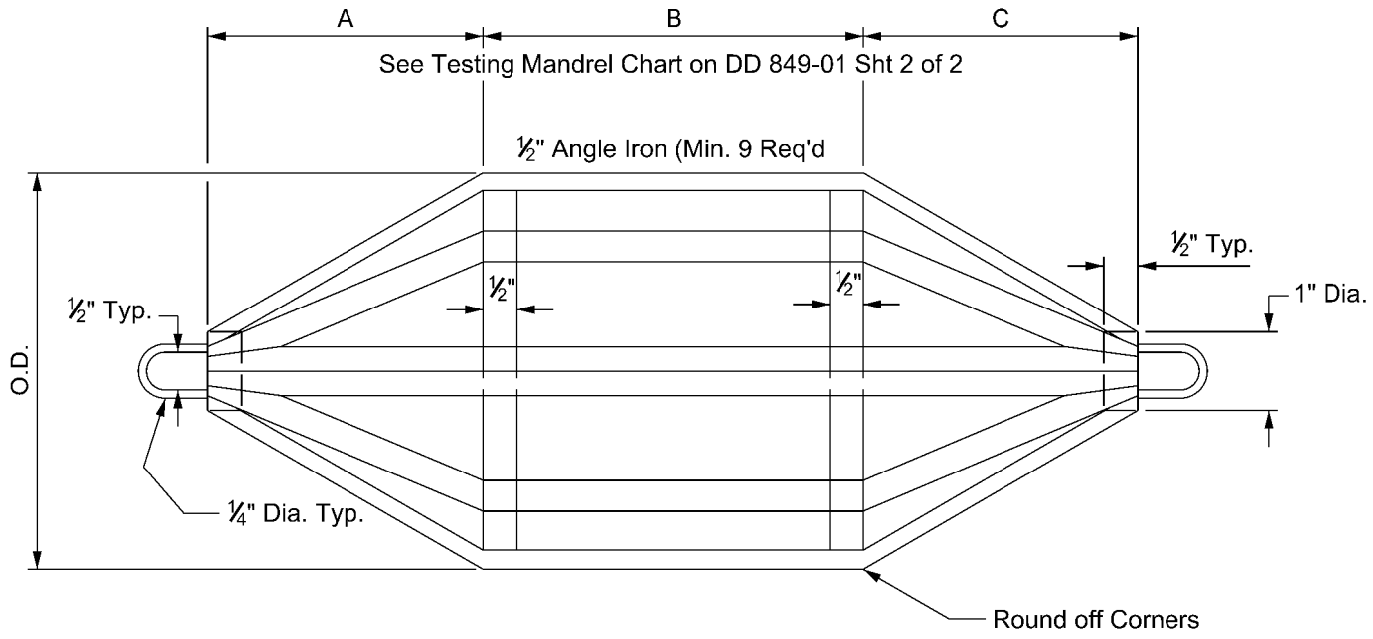
a. Mandrel Design: The rigid mandrel shall be constructed of a metal that can withstand 200 psi without being deformed.
b. The mandrel shall have nine or more "runners" or "legs" as long as the total number of legs is an odd number.
c. The barrel section of the mandrel shall have a length of at least 75% of the inside diameter of the pipe.
d. A proving ring shall be provided and used for each size mandrel in use.
e. Adjustable or flexible mandrels are prohibited. A television inspection is not a substitute for the deflection test.

849.6 MEASUREMENT: Measurement for the work specified herein will be by linear foot of successful test and as required by the contract documents.

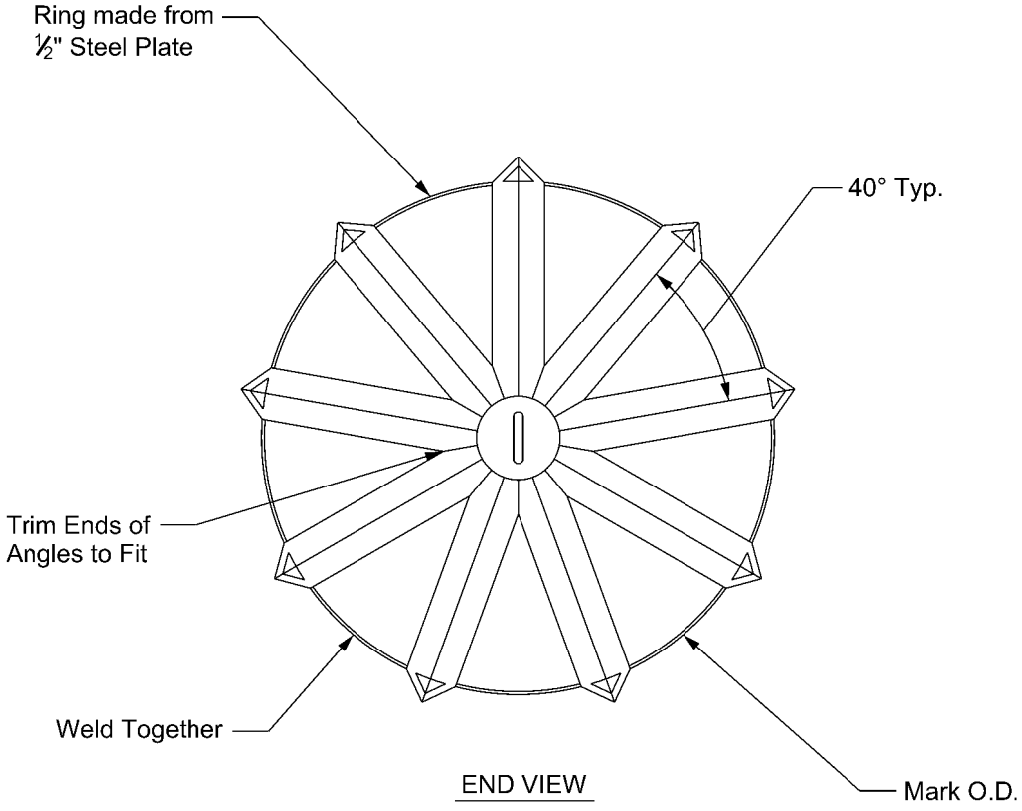
849.7 PAYMENT:

1. Payment for Sanitary Sewer Air and Deflection Testing shall be per linear foot of successful test.
2. Any effort required for multiple set-ups shall be included in the price.
3. All documentation and data, as required in this specification, must be provided to warrant payment.

End of Specification



SIDE OR TOP VIEW



END VIEW

Note:
All Mandrels must be Approved by SAWS Construction Inspection Dept.
and Stamped before Use.

PROPERTY OF SAN ANTONIO WATER SYSTEM SAN ANTONIO, TEXAS	INSTALLATION OF 1" AIR RELEASE VALVE	APPROVED MARCH 2008	REVISED AUG 2019
		DD 849-01	SHEET 1 OF 2

			MANDREL O.D.	RING O.D.
SIZE	A	B*	PVC (SDR - 26)	PVC (SDR - 26)
6"	4.0"	4.5"	5.50	4.79
8"	5.5"	6"	7.37	6.66
10"	7.0"	7.5"	9.21	8.50
12"	8.0"	9"	10.96	10.25
15"	10.0"	11"	13.42	12.71
18"	12.0"	13.5"	———	———
21"	14.0"	16"	———	———
24"	16.0"	18"	———	———
27"	18.0"	20"	———	———

* Minimum Length

CHART

Notes:
PVC Pipes and Fittings 6" to 15" in Diameter shall Conform to ASTM D-3034-08.
PVC Pipes and Fittings 18" to 27" in Diameter shall Conform to ASTM F-679-08.

This information is provided as a reference. All deflection testing shall be done in accordance with TCEQ Chapter 217.