

Testing:

Total Piping Solutions, Inc. provides proof of performance testing on all products manufactured and sold through our network of representatives and distributors.

All testing is performed in compliance with industry accepted standards including all applicable AWWA, ANSI, AWS, and MSSP standards.

Tapping Sleeves are tested per ASNI/AWWA C223-07 and to MSS SP-124-2012. These standards apply to Fabricated Steel and Stainless Steel Fabricated Tapping Sleeves. **Table of Related Standards:**

Standards Related to Specific Tapping Sleeve Performance		
1	ANSI/AWWA C223-07	Fabricated Steel and Stainless Steel Tapping Sleeves
2	MSS SP-124-2012	Fabricated Tapping Sleeves
Standards Related to Tapping Sleeve Components		
3	AWWA C228	Flanges
4	AWWA C207	Flanges
5	NSF/ANSI 61	Drinking Water System Components
6	ASTM A380-06	Cleaning Stainless Steel
7	ASTM A967-05	Passivating Stainless Steel
8	ASTM D2000	Rubber Classification
9	ASTM D240	Stainless Steel Type 304
10	ANSI B16.1	Class 125 Pound Flange Drilling
11	MSS SP-113-2013	Connecting Joint between Tapping Machine and Tapping Valve
Standards Related to Pipeline Materials		
12	ASTM D1785	Schedule Rated PVC Pipe (i.e. Schedule 40)
13	ASTM D2241-04a	PVC Pressure Rated Pipe (SDR Series)
14	ANSI/AWWA C906-7	PE Pressure Rated Pipe
15	ANSI/AWWA C900-07	PVC Pressure Pipe Fabricated Fittings 4" – 12" for Water Transmission and Distribution
16	AWWA C151/A21.51	Ductile Iron Pipe Centrifugally Cast in Metal Molds or Sand Lined Molds for Water and other Liquids
17	AWWA C200	Standard for Steel Water Pipe 6" and Larger
18	ANSI A21.51	Ductile iron Pipe
19	ASTM F-714	Standard Specification for polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter

All products are designed for use on the following pipe types:

1. Steel Pipe
2. Cast Iron Pipe
3. Ductile Iron pipe
4. Polyvinyl Chloride (PVC) Pipe
5. High Density (HD) (Ultra High Molecular Weight Polyethylene) Pipe
6. Asbestos Cement Pipe
7. Copper Pipe

The purpose of these tests is to demonstrate the hydrostatic strength and sealing capabilities of the TPS Triple Tap® Stainless Steel Tapping Sleeve.

In addition to materials, components, and marking requirements, both standards: **ANSI/AWWA C223-07 Fabricated Steel and Stainless Steel Tapping Sleeves** and **MSS SP-124-2012 Fabricated Tapping Sleeves** specify “Proof of Design” testing at or up to 150% of the rated operating pressure for the tapping sleeve.

For the purposes of the testing described herein, the target working pressure for full circumferential sealing of the Tapping Sleeve to the pipe material is 175 PSI. The testing hydrostatic test pressure required to be contained by the installed tapping sleeve shall be 265 PSI, or 150% of the pressure rating of the main conductor pipe, whichever is the lower.

The lower hydrostatic test pressures are typically encountered in testing the tapping sleeve on DR-17 high density polyethylene plastic pipe (HDPE) , DR 25 and DR 26 polyvinyl chloride (PVC) plastic pipe, where the conductor pipe hydrostatic test pressures are a function of pipe material and wall thicknesses (dimension ratios).

The following list describes the test regimes:

- A. Minimum Diameter of Tapping Sleeve Range Steel Test Pipe with 360 Degree CircumferentialL leak Simulation Groove (See Table 1).
- B. Maximum Diameter of Tapping Sleeve Range Steel Test Pipe with 360 Degree CircumferentialL leak Simulation Groove (See Table 1).
- C. Polyethylene Pipe Test Iron Pipe Size Diameter/Simulated “Size on Size” Tapping Hole
- D. Polyethylene Pipe Test Ductile Iron Pipe Diameter/Simulated “Size on Size” Tapping Hole
- E. PVC Pipe Test PVC Pipe Diameter(s)/Simulated “Size on Size” Tapping Hole

Minimum/Maximum Diameter Pipe Test Procedures:

Hydrostatic pressure tests of the TPS Triple Tap® Stainless Steel Tapping Sleeves are first performed on steel test pipes representing the minimum and maximum diameters of main conductor pipes for which each of the tapping sleeves are specified to be applied. These minimum and maximum diameter steel test pipes are specially machined to provide a circumferential leak groove to enable testing of the 360° circumferential sealing capabilities of the tapping sleeve and tapping sleeve gasket (See Fig. 1 and Fig. 2 below).

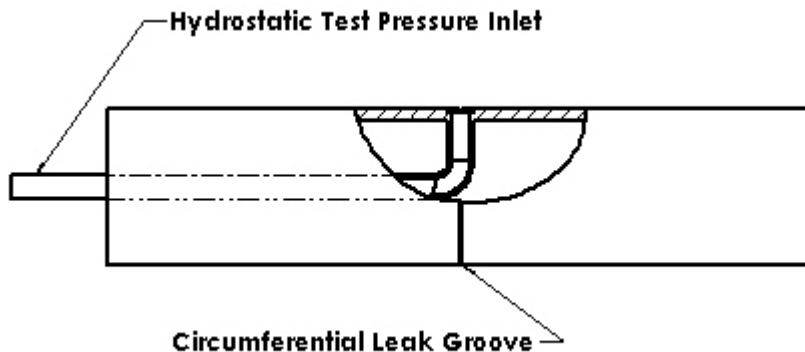


Fig. 1 Cutaway view of the simulated 360 Degree Full Break Leak Test Fixture

Full Break Groove Test Fixtures:

For the simulated full break test fixture, the groove dimensions are 1/8" wide x 3/16" deep. These dimensions are selected to simulate the pipe material displacement incurred when a ductile iron or cast iron pipeline undergoes a "beam break" failure. Beam break failures may occur in tapped/drilled ductile or cast iron pipelines at the drilled through hole. Typically the beam break will initiate at the point of minimum material in the pipe cross section (the widest dimension of the drilled hole transverse to the pipe axis). The beam break is typically caused by internal stresses in the cast material, and/or bending moments induced into the pipe by overburden and earthen cover shifting or settlement.

For the full beam break groove test, the tapping sleeve is assembled to the test pipe/fixture centered over the beam break groove. A blind flange is installed onto the branch flange and hydrostatic pressure is applied to the branch port through the pressure inlet that appears in the middle of the beam break groove (See Figures 2 and 3).

360 Degree

Circumferential
Leak Groove
1/8 In. wide x 3/16" deep

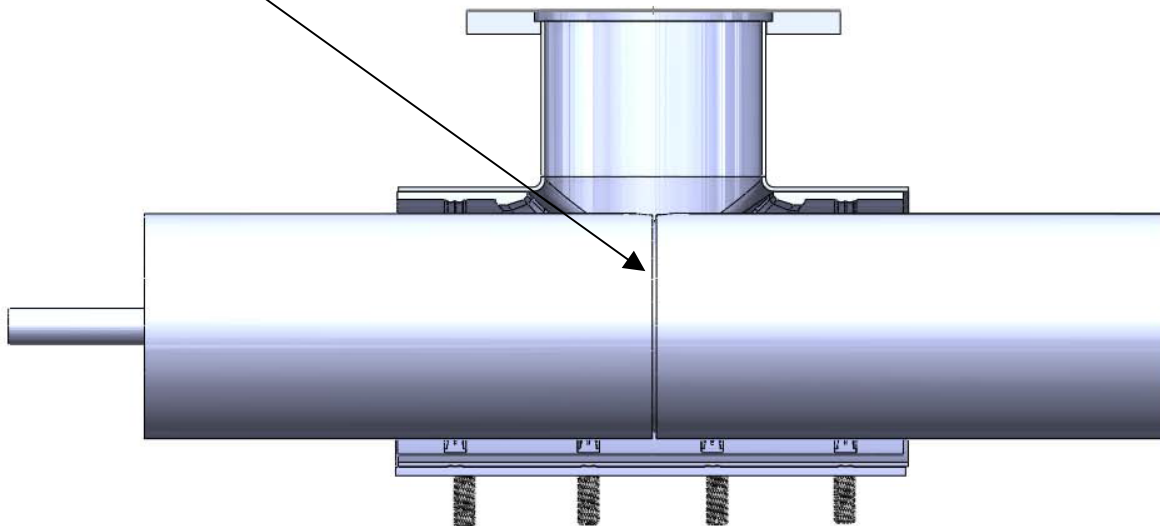


Fig. 2 Simulated 360 Degree Circumferential Leak Test Assembly

All Products are tested on Metallic and Non-Metallic Pipe.

Metallic pipe is testing is performed on a simulated full beam test as noted above.

Non-Metallic Pipe is tested on a simulated size on size tapped hole through the pipe side wall.

The TPS Triple Tap® Stainless Steel Tapping Sleeves also undergo hydrostatic pressure testing on High Density Polyethylene Pipe and Rigid PVC Pipe of pipe outside diameters that fall within the diameter range and wall thickness of each size category.

Each pipe material requires a specific set of test conditions to demonstrate satisfactory performance and compliance with specifications. Tapping sleeve testing on non-metallic main conductor pipes (i.e. High Density Polyethylene and Rigid PVC) shall employ a pre-cut 1/2" undersize (from nominal pipe diameter) hole thru the pipe sidewall to simulate sealing against the tapped main conductor pipe. Numerous field tests have also been performed installing the TPS Triple Tap® Stainless Steel Tapping Sleeve on PVC and UHMW PE pipe to verify performance correlation with this test data.

All Testing is performed on a short term and a long term basis.

TPS Triple Tap® Stainless Steel Tapping Sleeves tested on polyethylene and PVC pipe materials are assembled to the test pipe, tightened to the rated torque, and then retightened to rated bolt torque after a 15 minute waiting period. A short term rated test pressure is then applied for a period of 24 hours. Test pressure is then removed, for a period of 15 minutes, and the bolt torque values checked and recorded. Test pressure is then reapplied, with no re-torque of the bolts, and held for a period of 30 days.