Victaulic® System Solution For HDPE Pipe Qualification Tests IPS And ISO High-Density Polyethylene (HDPE)

19.50


Style 905


Style 908


Style 907


Style 904

1.0 PRODUCT DESCRIPTION

Available Sizes

- 2 – 36" IPS high-density polyethylene (HDPE) and IPS high-density polyethylene of raised temperature (PE-RT)
- 63 – 900 mm ISO high-density polyethylene (HDPE)

Pipe Materials

- HDPE pipe, PE4710 conforming to ASTM D3035 and ASTM F714, or PE100 conforming to ISO 4427-2
- PE-RT pipe conforming to ASTM D3350, cell class PE445574C, ASTM F2619, and ASTM F714
- Contact Victaulic for other pipe materials

Maximum Working Pressure:

- Pressure capabilities meet or exceed the performance capability of the HDPE or PE-RT pipe conforming to the standards listed in the Pipe Materials section.

Function

- Joins pipe, fittings, and valves
- For performance information, refer to Victaulic product submittals.
- For product installation instructions, refer to Victaulic Product Assembly Instructions (I-900)

ALWAYS REFER TO ANY NOTIFICATIONS AT THE END OF THIS DOCUMENT REGARDING PRODUCT INSTALLATION, MAINTENANCE OR SUPPORT.

System No.		Location	
Submitted By		Date	

Spec Section		Paragraph	
Approved		Date	

1.0 PRODUCT DESCRIPTION (CONTINUED)

Referenced Standards and Publications

- ASTM F2619 High-Density Polyethylene (PE) Line Pipe
- ASTM D3139 Joints for Plastic Pipe Using Flexible Elastomeric Seals
- ASTM D3350 Polyethylene Plastics Pipe and Fitting Materials
- ASTM F714 Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter
- ASTM F1804 Determining Allowable Tensile Load for Polyethylene (PE) Gas Pipe During Pull-In Installation
- AS NZS 4130 Polyethylene (PE) Pipes for Pressure Applications
- AWWA C901 Polyethylene (PE) Pressure Pipe and Tubing, ¾ In. Through 3 In. (19 mm Through 76mm.), for Water Service
- AWWA C906 Polyethylene (PE) Pressure Pipe and Fittings, 4 In. Through 65 In. (100 mm Through 1,650 mm.), for Waterworks
- PPI PACE (Pipeline Analysis and Calculation Environment)
- ISO 17885 Plastics Piping Systems - Mechanical Fittings for Pressure Piping Systems
- ISO 4427-2 Plastics Piping Systems - Polyethylene (PE) Pipes and Fittings for Water Supply
- FM 1613 Polyethylene Pipe and Fittings for Underground Fire Protection Service
- UL-213 Rubber Gasketed Fittings for Fire-Protection Service
- Handbook for Polyethylene Pipe Plastic Pipe Institute (PPI)

NOTE

- All references to HDPE within this document are inclusive of PE-RT

2.0 CERTIFICATION/LISTINGS

NOTES

- See individual product submittals for details.
- See Publication 10.01: Victaulic Fire Protection Approval Reference Guide for details.
- See Publication 02.06: Victaulic Approvals for Potable Water Products – ANSI/NSF 61 and ANSI/NSF 372 if applicable.
- WaterMark™ certification only applies to fusion-bonded epoxy-coated couplings with Grade “E” EPDM gaskets. Contact Victaulic for further details.

3.0 VACUUM TESTS

Description: Victaulic® System Solution for HDPE couplings were assembled onto high-density polyethylene PE4710 and PE100 pipe and subject to vacuum resistance testing in accordance with ASTM-D3139. The testing was done to validate product integrity with respect to pipe joint sealability when subjected to vacuum conditions.

Each test assembly consisted of three (3) couplings and two (2) pipe nipples. The test assembly for each size and pipe SDR was connected to a vacuum pump and subjected to a minimum of 22 in-Hg (75 kPa) vacuum pressure.

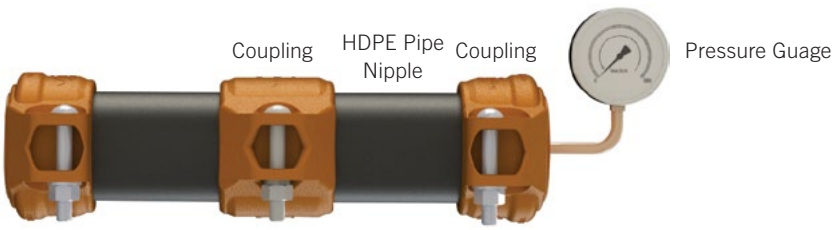

Figure 1

Results: The ASTM-D3139 test standard requires the assembled joint to withstand a vacuum of 22 in-Hg (75 kPa) for one (1) hour with no leakage. Victaulic testing was able to meet or exceed 22 in-Hg (75 kPa). For all sizes and pipe SDR, no increase in internal pressure was noted on any of the test samples after an exposure duration of one (1) hour.

3.1 AIR PRESSURE TESTS

Description: Victaulic® System Solution for HDPE couplings were assembled onto high-density polyethylene PE4710 and PE100 pipe and subject to low pressure pneumatic testing to validate product integrity with respect to short term pipe joint gasket sealability.

Each test assembly consisted of three (3) couplings and two (2) pipe nipples, as shown in Figure 1. The test assembly for each size and pipe SDR was filled with pressurized air at room temperature, the test assembly was then isolated from the inlet pressure and held for five (5) minutes at 10 psi (69 kPa), 25 psi (172 kPa), and 50 psi (345 kPa) respectively.

Results: The test requires the pressurized joint not to exceed pressure decay greater than 1%. No pressure loss was observed from any test assembly confirming the sealability of the Victaulic gasket.

3.2 SHORT TERM HYDROSTATIC PRESSURE TESTS

Description: Victaulic® System Solution for HDPE couplings were assembled onto high-density polyethylene PE4710 and PE100 pipe and proof tested in accordance with ISO 17885, Plastic Piping Systems – Mechanical Fittings for Pressure Piping Systems - Specifications. The testing was done to validate pipe joint and product integrity while under pressurized conditions.

Each test assembly consisted of three (3) couplings and two (2) pipe nipples, as shown in Figure 1. Test assemblies were filled with room temperature water and pressurized to a minimum 1.5 times pressure rating of the pipe and held for a minimum of one (1) hour.

In addition to ISO 17885, hydrostatic pressure testing was completed in accordance with FM Approvals test standard FM1613:2017 on Victaulic® System Solution for HDPE coupling sizes up to and including the 16” size. The test assemblies were filled with room temperature water and pressurized to 3.2 times the FM approved pressure rating of the pipe and held for five (5) minutes. Testing was witnessed by a Factory Mutual representative.

Results: For all sizes and SDR, no pressure loss or joint separation was observed for either the short term hydrostatic testing or FM approvals testing.

Table 1. FM 1613 Referenced Test Pressures

HDPE Pipe Material	Pipe SDR	FM Approved Pressure Class		Hydro Factor		Internal Pressure for Hydro Test (psi)
PE4710	9	250	x	3.2	=	800
PE4710	11	200	x	3.2	=	640

3.3 LONG TERM HYDROSTATIC PRESSURE TESTS

Description: Victaulic® System Solution for HDPE couplings were assembled onto high-density polyethylene PE4710 and PE100 pipe and proof tested in accordance with two (2) different long-term duration tests per ISO 4427-2, ASTM F714, and AS/NZS 4130. Victaulic investigated the standards globally and identified tests that met the most stringent conditions possible. These long-term tests were conducted as a life assessment for the pipe joint. These tests are common in the industry for validating HDPE Pressure pipe, however, Victaulic has chosen to apply this same pipe life testing protocol to validate the Victaulic® System Solution for HDPE.

Each test assembly consisted of three (3) couplings and two (2) pipe nipples, as shown in Figure 1. The assemblies were filled with water, conditioned, and tested for 1000-hours at either ambient or 180°F (80°C). The specifications cite the proper target hoop stress that should be achieved for each temperature environment. Test assemblies included pipe diameters and wall thicknesses sufficient to qualify the entire range of Victaulic HDPE couplings in all diameters and recommended wall thicknesses. Test specimen pipe nipples were specifically sized to concentrate loads/stresses at the test joints.

Results: No pressure loss, leakage, or signs of joint separation were observed during testing, regardless of size, pipe SDR, and test temperature.

3.4 CYCLIC PRESSURE TESTS

Description: Victaulic® System Solution for HDPE couplings were assembled onto high-density polyethylene PE4710 and PE100 pipe and subjected to cyclic pressure testing with peak pressure guidelines established by AWWA C C901 and C906. Total number of cycles was established by PPI PACE (Utilizing Default Design Value Range). This test was performed to assess the mechanical coupling's resistance to recurring and occasional surge pressures that may occur in water applications.

Each test assembly consisted of three (3) couplings and two (2) pipe nipples,as shown in Figure 1. An assembly in each size and pipe SDR was pressurized with water at an ambient temperature of 73°F (23°C). During the first phase of the test, internal pressure was cycled between 0.75 times and 2 times the rated working pressure for 18,250 total cycles, representing one occasional surge per day for 50 years. During the second phase of the test, internal pressure was cycled between 0.75 and 1.5 times the rated working pressure for 1,003,750 total cycles, representing 55 recurring surges per day for 50 years. A rate of 6 to 10 cycles/minute was maintained throughout both phases of the tests, which were run on the same assembly.

Results: No pressure loss or joint separation was observed from any test assembly, confirming the integrity of the Victaulic joint when exposed to recurring and occasional pressure surges.

3.5 LOW-TEMPERATURE PRESSURE TESTS

Description: Victaulic® System Solution for HDPE couplings were assembled onto high-density polyethylene PE4710 and PE100 pipe and subject to low temperature air testing with a modified version of UL213. This test was performed to validate pipe joint and product integrity with respect to low temperature sealing.

Each test assembly consisted of three (3) couplings and two (2) pipe nipples, as shown in Figure 1. The test assembly for all sizes and pipe SDR was pressurized with 40 psi (276 kPa) air at ambient temperature and then subject to a maximum temperature of 0°F (-18°C) for twenty four (24). Following that exposure, the assembly was brought to ambient temperature for an additional twenty four (24) hours, and the recovered pressure was measured to determine any loss in pressure.

Results: For all sizes and pipe SDR internal pressure fully recovered after the 24 hour low temperature exposure, indicating no pressure loss.

3.6 ALLOWABLE TENSILE LOAD TESTS

Description: Victaulic® System Solution for HDPE couplings were assembled onto high-density polyethylene PE4710 and PE100 pipe and subjected to end loading in accordance with guidelines established in ASTM-F1804. The test was performed to validate joint integrity when subjected to forces created by dragging joined lengths of unpressurized pipe across the terrain. Also, the results of this test provide insight into the joint's capability to withstand forces created by pipe expansion and contraction.

Each test assembly consisted of three (3) couplings and two (2) pipe nipples as shown in Figure 1. An assembly in each size and pipe SDR was subject to a hydraulically applied end load at ambient temperature for a duration of one (1) hour. The recommended duration for allowable tensile loads has been noted in the product submittals.

Results: No evidence of joint separation was observed during unpressurized end load testing, regardless of size and pipe SDR. Allowable tensile loads are listed in each respective product submittal.

3.7 FLEXURE TESTS

Description: Victaulic® System Solution for HDPE couplings were assembled onto high-density polyethylene PE4710 and PE100 pipe and subjected to flexural bend testing to validate pipe joint integrity for pipe that may be installed in curves, cold bent in the field, or subjected to bending induced by sunlight exposure.

Each test assembly consisted of three (3) couplings and two (2) pipe nipples as shown in Figure 1. Water filled test assemblies were mounted in a rigid test frame, internally pressurized to the pipe's rated pressure and hydraulically bent. Bending loads were slowly applied until the first leakage was observed. Suitable bend radii and factors of safety were established from these bend test results and correlated to industry accepted bend radii for HDPE pipe per Plastic Pipe Institute Handbook of PE Pipe (2nd ed, Chapter 7, Table 4).

Results: Victaulic® System Solution for HDPE was found to meet or exceed the pipe bend radius as defined by PPI. Allowable bend radii are listed in each respective product submittal.

Figure 2. Flexure test being performed on 24" IPS Victaulic Style 908 coupling assemblies.

Figure 3. Curved installation of 900 mm ISO Victaulic Style 908 couplings.

4.0 REFERENCE MATERIALS

05.01: Victaulic Gasket Selection Guide
19.07: Victaulic Style 905 Coupling for Plain End HDPE
19.09: Victaulic Style 908 Coupling for Double Grooved HDPE pipe
19.10: Victaulic Style 907 Transition Coupling for HDPE–to–Steel
19.11: Victaulic HDPE Plain End Fittings
19.12: Victaulic Style 904 Flange Adapter for HDPE–to–Flanged Pipe
29.01: Victaulic Terms and Conditions/Warranty
I-900: Victaulic HDPE Products Installation and Assembly Manual
I-905.REUSE: Victaulic Style 905 Reuse Instructions
I-ENDCAP: Victaulic End Caps Installation Instructions

