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Brand TPVs

Santoprene Thermoplastic Vulcanizate – A Thermoplastic Elastomer which Meets the ASTM F 477 Pipe Seal Specification

TL00400

TECHNICAL LITERATURE

Santoprene™ Thermoplastic Vulcanizate - A Thermoplastic Elastomer which Meets the ASTM F 477 Pipe Seal Specification

Introduction

For the past four decades, ASTM F 477, Standard Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe, has served as a basic document for the specification of numerous elastomeric seals for plastic pipe. In fact, numerous municipal and local plumbing codes throughout the United States are based on ASTM F 477.

Santoprene thermoplastic vulcanizate (TPV) is a thermoplastic elastomer (TPE) capable of meeting this specification which was originally developed for conventional thermoset rubber. Three premium grades, 101-55W185, 201-55W185 (colorable version of 101-55W185) and 141-55W185, meet the demanding set of requirements in ASTM F 477. Produced parts should be tested to verify they meet requirements.

Table I lists measured data for these three grades of Santoprene TPV, in comparison to the requirements of Table 2 of ASTM F 477. The properties of these grades of Santoprene TPV, as listed in Table I, clearly indicate that each grade meets the requirements of ASTM F 477.

ASTM F 477 is a basic document for a number of plastic pipe specifications. Specifications depending on ASTM F 477 include at least the following:

Plastic Pipe

D 3139	*Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals*
D 2680	*ABS and PVC Composite Sewer Pipe*
D 3212	*Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals*
F 789	*PS-46 PVC Plastic Gravity Flow Sewer Pipe and Fittings*
F 913	*Thermoplastic Elastomer Seals (Gaskets) for Joining Plastic Pipe*
D 1599	*Test Method for Short-Time Hydraulic Failure Pressure of Plastic Pipe Tubing and Fittings*
F 442	*CPVC Plastic Pipe (SDR-PR)*
F 441	*CPVC Plastic Pipe, Schedules 40 and 80*

D 3034 *Type PSM PVC Sewer Pipe and Fitting*

F 949 *PVC Corrugated Sewer Pipe with a Smooth Interior and Fittings*

F 679 *Large Diameter Plastic Gravity Sewer Pipe and Fittings*

F 794 *PVC Profile Gravity Sewer Pipe and Fittings Based on Controlled Outside Diameters*

F 645 *Selection, Design, and Installation of Thermoplastic Water Pressure Piping Systems*

D 2751 *ABS Sewer Pipe and Fittings*

ASTM F 477 is also a basic document for a number of ASTM fiberglass pipe specifications, including at least the following:

Fiberglass Pipe

D 3754 *Fiberglass Sewer and Industrial Pressure Pipe*

D 3517 *Fiberglass Pressure Pipe*

D 3840 *Fiberglass Pipe Fittings for New Pressure Applications*

D 3262 *Fiberglass Sewer Pipe*

D 4161 *Fiberglass Pipe Joints Using Flexible Elastomeric Seals*

The fact that Santoprene TPV does qualify under the ASTM F 477 specification enables its use in a broad variety of elastomeric seals for pipe applications. Further, grade 141-55W185 also meets the requirements of NSF International (formerly National Sanitation Foundation) Standard 61 for potable water.

The use of Santoprene TPV in plastic pipe applications enables a number of its inherent product advantages to be exploited:

1. Santoprene TPV has a much higher consistency of composition than a typical thermoset rubber, such as neoprene, EPDM or SBR rubber. Lot-to-lot consistency will ensure the reliable production of quality parts.

2. Santoprene TPV colorable grades (201-55W185) can be given virtually any color the end user desires. Thus, the end user will be able to color code Santoprene TPV pipe seals for

a given application to enable the different materials involved to be readily distinguished by sight. *Note: The addition of color may alter some properties.*

3. For many pipe gaskets, a design using Santoprene TPV can offer a significant cost saving versus thermoset rubber, especially for injection molded parts.

4. Santoprene TPV is suitable for co-molding with a number of polyolefins, thus reducing the need for a metal reinforcing ring. Proper extrusion of Santoprene TPV with a lower cost thermoplastic material can reduce cost and add value in design versatility.

5. Santoprene TPV 141-55W185 is currently listed under NSF Standard 61 for direct contact with potable water. It is one of the few commercial rubbers which meet this rigid standard.

6. Santoprene TPV is a long term sealing material. While the short term testing required by ASTM F 477 shows competitive sealing characteristics, the customer is encouraged to perform long-term testing for periods of over one month. Long-term testing allows oxidative attack to begin and will show dramatic differences in material sealability. Santoprene TPV resists oxidation and thus continues to perform for very long periods of time. See our Technical Literature (TL), *"Sealing with Santoprene TPV"*, for further details on this subject.

7. Santoprene TPV exhibits excellent resistance to chloramines. The TL, *"Resistance to Aqueous Chloramines"*, documents long-term testing we performed.

Summary

For more information, contact your local representative or our AnswerPerson^{SM}. Also, we welcome your visit to our web site:

http://www.santoprene.com

Table I

Physical Requirements for Thermoplastic Elastomeric Seals for Plastic Pipe – Santoprene TPV

Properties	ASTM Test Method	Physical Requirements for TPE Seals for Plastic Pipe in Low-Head Application (below 150 kPa or 50-ft head) (ASTM D 477)	Santoprene TPV Grade		Pass or Fail for Both Grades
			101-55W185*	141-55W185	
Original Properties					
Tensile strength, min., MPa (psi)	D 412	3.0 (435)	4.9 (715)	5.3 (775)	Pass
100% modulus, min., MPa (psi)	D 412	1.4 (200)	2.0 (290)	2.0 (290)	Pass
Elongation, min., %	D 412	350	380	400	Pass
Hardness, Type A durometer	D 2240	40 to 70	60	60	Pass
Low temperature hardness, Type A durometer, max. increase, points	D 2240	10	6	6	Pass
Compression set, max. %, 22 hrs/70°C (158°F)	D 395, method B	25	20	18	Pass
Ozone resistance	D 1149	no cracks	no cracks	no cracks	Pass
Accelerated aging (air oven test) 96 hrs/70°C (158°F)					
Decrease in tensile strength, max % of original	D 573	15	2	6	Pass
Decrease in elongation, max % of original	D 573	15	8	5	Pass
Hardness, Type A durometer, max change, pts	D 573	5	2.2	0.3	Pass
After water immersion					
Change in volume, max %	D 471	4	0	0	Pass
Force decay (stress relaxation), 168 hrs/23°C (73°C), min %	F 913	40	74	74	Pass

*201-55W185 is the colorable version of 101-55W185 and test results should be similar. Produced parts should be tested.

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