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Endorsed by the
Cast Iron Soil Pipe Institute

Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings[1]

This standard is issued under the fixed designation C564; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This specification covers preformed rubber gaskets used to seal joints in cast iron soil pipe and fittings.

1.2 The committee with jurisdiction over this standard is not aware of another comparable standard for materials covered in this standard.

1.3 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.4 The following safety hazards caveat pertains only to the test methods section of this specification:*This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

A644 Terminology Relating to Iron Castings

C1277 Specification for Shielded Couplings Joining Hubless Cast Iron Soil Pipe and Fittings

D395 Test Methods for Rubber Property—Compression Set

D412 Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension

D471 Test Method for Rubber Property—Effect of Liquids

D573 Test Method for Rubber—Deterioration in an Air Oven

D624 Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomers

D1149 Test Methods for Rubber Deterioration—Cracking in an Ozone Controlled Environment

D1415 Test Method for Rubber Property—International Hardness

D2240 Test Method for Rubber Property—Durometer Hardness

D3677 Test Methods for Rubber—Identification by Infrared Spectrophotometry

2.2 *Other Documents*

RMA *Class 3 Dimensional Tolerances, RMA Manual*[3]

CISPI 310 Specification for couplings for use in connection with hubless cast iron soil pipe and fittings for sanitary and storm drain, waste, and vent piping applications[4]

3. Terminology

3.1 *Definitions*—For definitions of terms in this standard see Terminology A644.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *flash, n*—the excess material protruding from the surface of a molded article at the mold junction.

3.2.2 *manufacturer, n*—the entity that molds the gaskets covered by this standard.

3.2.3 *virgin rubber, n*—a term that may be used interchangeably with raw rubber (raw thermoset elastomer). A rubber or thermoset elastomer that has not had any additional work, diluents incorporated, processes performed on it, or any combination thereof. A rubber that is in an unmodified state or one in which no attempt has been made to alter it in any fashion as received from the manufacturer or supplier.

4. Materials and Manufacture

4.1 Gaskets shall be made of a properly vulcanized virgin compound containing virgin rubber as the sole elastomer with no scrap or reclaim.

4.2 Gaskets manufactured for use in couplings complying with Specification C1277 or CISPI 310 shall be manufactured from a properly vulcanized virgin compound in which the

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] Available from Association for Rubber Products Manufacturers (ARPM), 7321 Shadeland Station Way, Suite 285, Indianapolis, IN 46256, http://www.arpminc.org.

[4] Available from Cast Iron Soil Pipe Institute (CISPI), http://www.cispi.org.

primary elastomer is polychloroprene (neoprene). The gaskets shall be tested in accordance with Test Methods D3677.

5. Physical Requirements

5.1 Sample gaskets selected as specified in Section 8 shall conform to the requirements for physical properties listed in Table 1 when tested in accordance with the methods specified in Section 9.

6. Dimensions and Permissible Variations

6.1 Gaskets shall conform to the dimensions specified by the manufacturer.

6.2 All cross-sectional dimensions shall have an RMA Class 3 tolerance as shown in Annex A1, and all diametral dimensions shall have a tolerance of ± 1 percent.

7. Workmanship

7.1 The surface of the gasket shall be smooth and free of pitting, cracks, blisters, air marks, and any other imperfections that will affect its behavior in service. The body of the gasket shall be free of porosity and air pockets.

7.2 Neither the flash thickness nor the flash extension shall exceed 1/32 in. (0.8 mm), at any point on the sealing ring.

7.3 The offset, or failure of the mold to register accurately, shall not exceed 1/64 in. (0.4 mm).

8. Sampling

8.1 For each of the tests, gaskets shall be selected at random and tests be performed by the method and frequency of the tests as specified in Section 9.

9. Test Methods

9.1 *Hardness*—The gasket material shall be tested for hardness in accordance with ASTM Test Method D2240. Test Method D1415 shall be used as the referee method. Hardness measurements shall be made on specimens prepared in accordance with 9.2. However, hardness readings for guidance purposes shall be permitted to be taken directly on the gasket, recognizing that these readings may vary slightly from those taken on the dumb-bell specimens. Tests shall be performed during the day of production not to exceed a 24-h period for each size and type gasket produced during that period.

9.2 *Elongation and Tensile Strength*—The gasket material shall be tested for elongation and tensile strength in accordance with Test Methods D412. Standard ASTM Type C dumb-bell specimens conforming to Fig. 1 (Apparatus for Tensile Set Test) of Test Methods D412 shall be cut from a section of the gasket for this test. To obtain a uniform thickness, these gasket sections shall be permitted to be buffed prior to cutting into dumb-bell specimens, so as to produce a finely ground surface without cuts or burns. Tests shall be performed during the day of production not to exceed a 24-h period for each size and type gasket produced during that period.

9.3 *Tear Strength*— The gasket material shall be tested for tear strength in accordance with Test Method D624 using Die C. Tests shall be performed during the day of production not to exceed a 24-h period for each size and type gasket produced during that period.

9.4 *Compression Set*— The gasket material shall be tested for compression set in accordance with Test Methods D395 using Method B. Specimens shall be aged in an oven for 22 h at 158 ± 2°F (70 ± 1°C). Where plied specimens are necessary, the results shall comply with the requirements of Table 1. Tests shall be performed after 24 h but not longer than 72 h after day of production for each size and type gasket produced during that day.

9.4.1 When testing pipe gaskets, the prepared specimens shall be 1-in. disks cut from prepared samples .075 in. (1.905 mm) to .090-in. (2.286 mm) thick and not to exceed seven (7) plies. For hubless coupling gasket inserts a test specimen measuring .43 in. (10.922 mm) × .75 in. (19.05 mm) may be cut directly from the part provided the sample is of consistent thickness. The thickness of the sample shall be measured in accordance with Test Methods D395, section 13.1. Since all specimens from hubless pipe gaskets are curved, not flat, it is important to measure the thickness in the center of the sample

TABLE 1 Physical Requirements of Gaskets

Property	Requirements			ASTM Test Method
	A	B	C	
Hardness (nominal durometer ±5) as specified by the pipe manufacturer	50	60	70	D2240
Elongation, min, %	350	300	250	D412
Tensile strength, min, psi	1500	1500	1500	D412
(MPa)	(10)	(10)	(10)	
Tear strength, min, lbf/in.	150	150	150	
(N/cm)	(268)	(268)	(268)	D624
Compression set, max, %	25	25	25	D395
Heat aging, 96 h at 158 ± 2°F (70 ± 1°C):				D573
Hardness increase, max, durometer points	10	10	10	...
Loss in tensile strength, max,%	15	15	15	...
Loss in elongation, max, %	20	20	20	...
Water absorption:				D471
Weight increase, max, %	20	20	20	...
Ozone resistance	no cracks	no cracks	no cracks[A]	D1149
Oil immersion:				
Volume increase, max, %	80	80	80	D471

[A] Note—Ozone Resistance on 70 hardness Hubless Pipe Gaskets shall be tested at 1/1,000,000 (1PPM).

with the specimen laying in a concave manner. Measure the thickness of each ply and add the measured thickness of each ply (not to exceed seven plies) to determine the original plied up thickness (to). The plied up target thickness should be approximately .50 in. Take the original plied up thickness (to) and multiply it by .75 to determine the thickness of the spacer bar to be used (tn). Assemble the plied up specimens in the test fixture (Test Methods D395, Fig. 3) with the proper thickness spacer bars and place in oven for 22 h at 158 +/- 2°F (70 +/- 1°C). At the end of the test period take the device from the oven and remove the test specimens immediately and allow to cool in accordance with Test Methods D395, section 13.4. After the cooling period measure the final thickness at the center of the plied up test specimen placed in a concave position on the dial micrometer to determine the final thickness (ti). Calculate the compression set expressed as a percentage of the original deflection as follows:

$$CB = [(to - ti)/(to - tn)] \times 100$$

CB = compression set value test method B
to = original plied up thickness
ti = final plied up thickness
tn = thickness of spacer bar used

9.5 *Heat Aging*—The gasket material shall be tested for effects of heat aging in accordance with 9.2, and shall be aged for 96 h at 158 ± 2°F (70 ± 1°C). Hardness measurements shall be made as specified in 9.1. Test shall be performed annually or when a formulation change has occurred, or a source of supply has changed, whichever is the shorter period.

9.6 *Water Absorption*—The gasket material shall be tested for weight increase due to water absorption in accordance with Test Method D471. If a 1-in. (25.4-mm) specimen cannot be cut from the sample gasket, the greatest width obtainable shall be used. The test specimen shall be immersed in distilled water at 158 ± 2°F (70 ± 1°C) for 7 days. Test shall be performed annually or when a formulation change has occurred, or a source of supply has changed, whichever is the shorter period.

9.7 *Ozone Resistance*—The gasket material shall be tested for ozone resistance in accordance with Test Method D1149, using specimens and procedure specified under Method B. The ozone concentration shall be 150 parts/100 000 000 of air by volume. Specimens shall be aged 100 ± 1h at 104 ± 2°F (40 ± 1°C). A two-power hand magnifying glass shall be used to examine the gasket for cracks. Test shall be performed annually or when a formulation change has occurred, or a source of supply has changed, whichever is the shorter period.

9.7.1 When testing gaskets used in hubless pipe couplings, the ozone concentration shall be 100/100 000 000 (1PPM) of air by volume.

9.8 *Oil Immersion*— The gasket material shall be tested for volume decrease due to oil absorption in accordance with Test Method D471. If a 1-in. (25.4 mm) specimen cannot be cut from the sample gasket, the greatest width obtainable shall be used. The test specimen shall be immersed in IRM 903 for 70 ± 0.7 h at 212 ± 2°F (100 ± 1°C). Test shall be performed annually or when a formulation change has occurred, or a source of supply has changed, whichever is the shorter period.

10. Certification

10.1 Upon request, the purchaser, design professional, or the administrative authority having jurisdiction where the products are being installed shall be furnished certification, by the manufacturer, stating samples representing each lot have been tested and inspected as indicated in this specification and the requirements have been met. If requested by the purchaser, design professional, or the administrative authority having jurisdiction where the products are being installed, certification shall be accompanied by test reports as prepared in accordance with the Sections 4 – 9 of this specification. Certification shall include the legal name and address of the manufacturer.

10.2 Third Party certifiers or inspectors shall utilize the procedures detailed in Annex A1 when conducting inspections at the manufacturing locations.

11. Marking

11.1 Mark each gasket with clearly legible letters not exceeding ¼ in. (6.35 mm) in height. These markings shall include the gasket manufacturer's name or symbol, the pipe size and class (such as NH for no hub, SV for service, XH for extra heavy), country of origin and the ASTM specification designation. Rubber Compression gaskets shall be required to have the year of manufacture in addition to the other required markings of this section.

12. Keywords

12.1 cast iron; fittings; gaskets; pipe; rubber

ANNEXES

(Mandatory Information)

A1. RUBBER MANUFACTURERS ASSOCIATION, INC. TOLERANCES

See Table A1.1.

TABLE A1.1 RMA Class 3 Dimensional Tolerances (Commercial Tolerances)

Size, in. (mm)	Fixed[A]	Closure[B,C]
0 to 0.499 (0 to 12.67)	±0.010 (±0.254)	±0.015 (±0.381)
0.500 to 0.999 (12.7 to 25.37)	±0.010 (±0.254)	±0.018 (±0.457)
1.000 to 1.999 (24.4 to 50.77)	±0.015 (±0.381)	±0.020 (±0.508)
2.000 to 2.999 (50.8 to 76.17)	±0.020 (±0.508)	±0.025 (±0.635)
3.000 to 3.999 (76.2 to 101.57)	±0.025 (±0.635)	±0.030 (±0.762)
4.000 to 4.999 (101.6 to 126.97)	±0.030 (±0.762)	±0.035 (±0.889)
5.000 to 7.999 (127.0 to 203.17)	±0.035 (±0.889)	±0.050 (±1.27)
Greater than 8.000 (Greater than 203.2)	multiply by	0.0050 (1.27)

[A] Fixed dimensions are those that are parallel to the mold parting line or major mold sections and that are not affected by flash thickness variations. Tolerances apply individually to each fixed dimension according to its own size.
[B] Closure dimensions are those vertical to the mold parting line or parting lines of major sections and are affected by flash thickness variation.
[C] The tolerance on closure dimensions is that tolerance for the largest closure dimension. This tolerance is then applied to all other closure dimensions.

The following supplementary requirements shall be applied when the manufacturer or seller of the products covered by this specification utilizes third party certification agencies as part of their certification as detailed in Section 10 of this specification.

A2. THIRD PARTY CERTIFICATION OR INSPECTION

A2.1 Third Party certifiers or inspectors conducting regular inspections at the manufacturer's production facility shall include but not be limited to the following during each inspection.

A2.1.1 A review of the manufacturer's records to verify compliance with Sections 4 – 9 of this standard. Copies of the manufacturer's test reports shall be added to the third party certifiers inspection report.

A2.1.2 Random inspections of the manufacturer's finished goods inventory shall be conducted during each inspection. These inspections shall include a dimensional and marking inspection of not less than 10 randomly selected gaskets of different sizes and types during inspection. Each gasket used as part of a coupling shall be subject to the requirements of the applicable coupling standard.