



~~Designation: C443M-05~~ Designation: C 443 – 05a^{ε1}

~~Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets [Metric]~~ Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets¹

This standard is issued under the fixed designation ~~C443M~~; C 443; 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 Department of Defense.

^{ε1} NOTE—Section references in 9.1.3 were corrected editorially in October 2009.

1. Scope

1.1 This specification covers flexible watertight joints for ~~circular concrete sewer and culvert pipe~~ and precast manhole sections, using rubber gaskets for sealing the joints, where infiltration or exfiltration is a factor in the design. The specification covers the design of joints and the requirements for rubber gaskets to be used therewith, for pipe conforming in all other respects to Specification ~~C14M 14~~ or, Specification ~~C76M 76~~, or Specification C 507 and precast manhole section conforming in all other respects to Specification ~~C478M 478~~, provided that if there is conflict in permissible variations in dimensions the requirements of this specification for joints shall govern.

1.2 ~~This specification is the metric counterpart of Specification C443.~~

1.2 A complete metric companion to Specification C 443 has been developed—~~C 443M~~; therefore, no metric equivalents are presented in this specification.

NOTE 1—This specification covers the ~~design, material, design~~ and performance of the rubber gasket joint only. Joints covered by this specification are normally adequate for hydrostatic pressures up to ~~90 kPa (9 m)~~ 13 psi (30 ft) without leakage, when tested ~~per in accordance with Section 109~~. Infiltration or exfiltration quantities for an installed pipeline are dependent upon many factors other than the joints, and allowable quantities must be covered by other specifications and suitable testing of the installed pipeline and system.

2. Referenced Documents

2.1 ASTM Standards:²

~~C14M 14~~ Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe [Metric]

~~C76M 76~~ Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe [Metric]

~~C478M 478~~ Specification for Precast Reinforced Concrete Manhole Sections [Metric] [[13f7dc6a9/astm-c443-05a1](https://doi.org/10.1520/C443-05a1)]

~~C497M~~ Test Methods for Concrete Pipe, Manhole Sections, or Tile [Metric] 507 Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe

~~C 822 Terminology Relating to Concrete Pipe and Related Products~~ D395 Test Methods for Rubber Property—Compression Set

~~D412 Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers—Tension~~

~~D471 Test Method for Rubber Property—Effect of Liquids~~

~~D573 Test Method for Rubber—Deterioration in an Air Oven~~

~~D1149 Test Method for Rubber Deterioration—Surface Ozone Cracking in a Chamber~~

~~D2240 Test Method for Rubber Property—Durometer Hardness~~

C 1619 Specification for Elastomeric Seals for Joining Concrete Structures

3. Terminology

3.1 *Definitions:*—For definitions of terms relating to concrete pipe, see Terminology C 822.

¹ This specification is under the jurisdiction of ASTM Committee C13 on Concrete Pipe and is the direct responsibility of Subcommittee C13.08 on Rubber Gaskets. Current edition approved January 1, 2005. Published February 2005. Originally approved in 1980. Last previous edition approved in 2003 as ~~C433M-03~~ on Joints for Precast Concrete Structures.

Current edition approved Oct. 1, 2005. Published October 2005. Originally approved in 1959. Last previous edition approved in 2005 as C 443 – 05.

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.

4. Basis of Acceptance

4.1 The acceptability of the pipe joints and gaskets shall be determined by the results of the physical tests prescribed in this specification, if and when required, and by inspection to determine whether the pipe joints and gaskets conform to this specification as to design and freedom from defects.

5. Materials and Manufacture for Gaskets

5.1 All rubber gaskets shall be extruded or molded and cured in such a manner that any cross section will be dense, homogeneous, and free of porosity, blisters, pitting, and other imperfections. The gaskets shall be extruded or molded to the specified size within a tolerance of $\pm 6\%$ on any dimension, measured at any cross section. The rubber gasket shall be fabricated from a high-grade rubber compound. The basic polymer shall be natural rubber, synthetic rubber, or a blend of both acceptable to the owner and meeting the physical requirements prescribed in Section 6.

6. Physical Requirements for Gaskets

5.1 All rubber gaskets shall comply with Specification C 1619 in terms of materials and manufacture. The gaskets shall be extruded or molded to the specified size within a tolerance of $\pm 6\%$ on any dimension, measured at any cross section.

6. Physical Requirements for Gaskets

6.1 *Testing*—testing shall be in accordance with Section 9.

6.1.1 *Standard Gasket Requirement*—The gaskets shall meet with the following physical requirements:

Tensile strength, min	8 MPa
Elongation at break, min, %	350
Shore durometer hardness:	
Min	35 ^A
Max	65 ^A
Compression set, max, % of original deflection	25
Accelerated aging, max % of original	
Decrease in tensile strength	15
Decrease in elongation	20
Liquid immersion, max % weight increase	
Water absorption by weight, max, %	10
Ozone resistance	no cracks in accordance with Test Method D1149

^AAllowable variation ± 5 from manufacturer's specified hardness provided the actual hardness is within the limits of 35 to 65.

6.1.2 *Standard Gasket Requirements*—All rubber gaskets shall meet the dimensions, tolerances, and physical requirements of Specification C 1619, Class C.

6.2 *Oil Resistant Gasket Requirements*—The compound shall contain not less than 50% by volume oil resistant polymer and shall meet the following physical requirements:

Tensile strength, min	8 MPa
Elongation at break, min, %	350
Shore durometer hardness, nominal:	
Min	35 ^A
Max	65 ^A
Durometer aging, max increase	15
Compression set, % (22 h at 70°C)	25
Accelerated aging (96 h at 70°C):	
Decrease in tensile strength, max, % of original	20
Decrease in elongation, max, % of original	40
Liquid immersion (max % volume change):	
Oil, IRM 903 oil (70 h at 100°C)	80
Water (48 h at 70°C)	15
Ozone resistance, 72 h exposure in 50 PPM ozone concentration at 40°C	no visible cracking

^AAllowable variation ± 5 from manufacturer's specified hardness provided the actual hardness is within the limits of 35 to 65.

6.2 If a splice is used in the manufacture of the gasket, the strength shall be such that the gasket shall withstand 100% elongation over the part of the gasket which includes the splice with no visible separation of the splice. While in the stretched position, the gasket shall be rotated in the spliced area a minimum of 180° in each direction in order to inspect for separation. In addition, any portion of the splice shall be capable of passing a bend test without visible separation. The bend test for gaskets is defined as wrapping the portion of the unstretched gasket containing the splice a minimum of 180° and a maximum of 270° around a rod. For O-ring gaskets the diameter of the rod shall be equal to the cross-section diameter of the gasket. For noncircular gaskets, the rod diameter shall not be less than 13 mm or more than 25 mm.

6.3 Gasket swell has a bearing on joint performance. The pipe manufacturer shall set appropriate limits for swell and durometer change of the gasket material and “wash off” for the gasket lubricant. These limits shall then be verified by test methods described in Test Methods C497M. Gasket lubricant shall not be altered, corrupted, or diluted from its original formulation as tested and certified prior to use on the gasket for installation purposes.