Designation: C990M – 09 (Reapproved 2019)

Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants (Metric)[1]

This standard is issued under the fixed designation C990M; 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.

1. Scope

1.1 This specification covers joints for precast concrete pipe and box and other sections using preformed flexible joint sealants for use in storm sewers and culverts which are not intended to operate under internal pressure, or are not subject to infiltration or exfiltration limits. Joint material used in horizontal applications is intended to prevent the flow of solids through the joint.

1.2 Precast concrete manhole sections and other vertical structures that are subject to internal or external pressure, infiltration, or exfiltration limits are not prohibited from being specified. Joints in vertical structures covered by this specification are intended mainly to prevent the flow of solids or fluids through the joint.

1.3 This specification is to be used with pipe and structures conforming in all respects to Specifications C14M, C76M, C478M, C506M, C507M, C655M, C985M, C1433M, C1504M, and C1577, provided that if there is a conflict in permissible variations in dimensions, the requirements of this specification shall govern.

1.4 This specification is the metric companion of Specification C990.

NOTE 1—This specification covers the material and performance of the joint and sealant only. Infiltration and exfiltration quantities for installed sections are dependent on factors other than the joints which must be covered by other specifications and suitable testing of the installed pipeline.

1.5 *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, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.6 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

C14M Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe (Metric)

C76M Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe (Metric)

C478M Specification for Circular Precast Reinforced Concrete Manhole Sections (Metric)

C506M Specification for Reinforced Concrete Arch Culvert, Storm Drain, and Sewer Pipe (Metric)

C507M Specification for Reinforced Concrete Elliptical Culvert, Storm Drain, and Sewer Pipe (Metric)

C655M Specification for Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe (Metric)

C822 Terminology Relating to Concrete Pipe and Related Products

C972 Test Method for Compression-Recovery of Tape Sealant

C985M Specification for Nonreinforced Concrete Specified Strength Culvert, Storm Drain, and Sewer Pipe (Metric)

C1433M Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers (Metric)

C1504M Specification for Manufacture of Precast Reinforced Concrete Three-Sided Structures for Culverts and Storm Drains (Metric)

C1577 Specification for Precast Reinforced Concrete Monolithic Box Sections for Culverts, Storm Drains, and Sewers Designed According to AASHTO LRFD

D4 Test Method for Bitumen Content

D6/D6M Test Method for Loss on Heating of Oil and Asphaltic Compounds

D36/D36M Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus)

[1] This specification is under the jurisdiction of ASTM Committee C13 on Concrete Pipe and is the direct responsibility of Subcommittee C13.08 on Joints for Precast Concrete Structures.

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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.

D71 Test Method for Relative Density of Solid Pitch and Asphalt (Displacement Method)
D92 Test Method for Flash and Fire Points by Cleveland Open Cup Tester
D113 Test Method for Ductility of Asphalt Materials
D217 Test Methods for Cone Penetration of Lubricating Grease
D297 Test Methods for Rubber Products—Chemical Analysis

2.2 *AASHTO Standards:*[3]

T47 Test for Loss of Heating of Oil and Asphaltic Compounds
T48 Test for Flash and Fire Points by Cleveland Open Cup
T51 Test for Ductility of Bituminous Material
T111 Test for Inorganic Matter or Ash
T229 Test for Specific Gravity of Asphalts and Tar Pitches Sufficiently Solid to be Handled in Fragments

3. Terminology

3.1 *Definitions*—For definitions of terms relating to concrete pipe, see Terminology C822.

4. Basis of Acceptance

4.1 The acceptability of the pipe joint and sealant 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 joint and the sealant conform to this specification as to design and freedom from defects.

5. Materials and Manufacture for Sealants

5.1 Bitumen sealants shall be produced from asphalts, hydrocarbon resins and plasticizing compounds reinforced with inert mineral filler and shall contain no solvents. Butyl rubber sealants shall be produced from blends of butyl rubber and refined hydrocarbon resins and plasticizing compounds reinforced with inert mineral filler and shall contain no solvents.

5.2 Blends of material used in the manufacture of flexible joint sealants shall be approved by the owner and meet the composition and physical requirements prescribed in Section 6. The joint sealant shall not depend on oxidizing, evaporating, or chemical action for its adhesive or cohesive strength and shall be supplied preformed and of suitable cross section and size to seal the joint annular space when the sections are joined. For a given joint size, the sealing material, as furnished, shall be such so as to encircle the outside circumference of the spigot or tongue of the joint or the inside circumference of the bell or groove and shall not be stretched when seated in the joint. Sealant material shall be furnished in the required length and cross-sectional dimensions, and the dimensions shall be clearly marked. Sealant material shall be preformed to the following specified tolerances:

	Tolerance
Length, %	+5, −0
Cross sectional area, %	+10, −5
Volume, mm^3/linear m, %	+5, −5
Cross-sectional dimensions, mm, %	+10, −5[A]

[A] Dimensions in the field may vary from preformed dimensions.

6. Physical Requirements for Sealants

6.1 *Bitumen Sealants:*

6.1.1 Bitumen sealants shall comply with the following composition and physical requirements. Testing shall be in accordance with the methods prescribed in Section 9.

Hydrocarbon Blends, % by weight	50 min
Ash-Inert Mineral Matter, % by weight	25 min
Volatile matter, % by weight	3 max
Specific gravity at 25°C	1.15 to 1.40
Ductility at 25°C, cm	5 min
Flash Point, C.O.C.	177°C min
Fire Point, C.O.C.,	191°C min
Softening Point,	160°C min
Compression Index at 25°C, N/cm^3	27 max
Compression Index at 0°C, N/cm^3	95 max
Cone Penetration at 25°C, 150g, 5s, dmm	50 to 120
Cone Penetration at 0°C, 150g, 5s, dmm	15 min
Chemical Resistance	No deterioration, no cracking, no swelling

6.2 *Butyl Rubber Sealant:*

6.2.1 Butyl rubber sealants (elastomeric polymer shall be butyl rubber only) shall comply with the following composition and physical requirements. Testing shall be in accordance with the methods prescribed in Section 9.

Butyl Rubber (hydrocarbon blends), % by mass	50 min
Ash-Inert Mineral Matter, % by mass	30 min
Volatile Matter, % by mass	3 max
Specific Gravity at 25°C	1.15 to 1.40
Ductility at 25°C, cm	5.0 min
Flash Point, C.O.C.	177°C min
Fire Point, C.O.C.	191°C min
Compression Index at 25°C, N/cm^3	27 max
Compression Index at 0°C, N/cm^3	54 max
Cone Penetration at 25°C, 150 g, 5 s, dmm	50 to 120
Cone Penetration at 0°C, 150 g, 5 s, dmm	30 min
Chemical Resistance	No deterioration, no cracking, no swelling

7. Design of Joints

7.1 The pipe manufacturer shall furnish the owner with the detailed design of the joint. The sealant manufacturer shall furnish a complete list of joint sizes showing the minimum size of material to be used with each size joint, along with complete instructions on recommended installation procedures.

7.1.1 The joint design shall consist of a bell or groove on one end of the section and a spigot or tongue on the adjacent end of the joining section.

7.1.2 All surfaces of the joint upon or against which the sealant will bear shall be free of spalls, cracks or fractures, and imperfections that would adversely affect the function of the joint.

7.1.3 The joints of the sections shall be of such design that they will withstand the forces caused by the compression of the sealant when joined, without cracking or fracturing when tested, in accordance with Section 10.

7.1.4 For horizontal installations, the angle of taper on the conic surfaces of the inside of the bell or groove and the outer surface of the spigot or tongue where the sealant seats shall be

[3] Available from American Association of State Highway and Transportation Officials (AASHTO), 444 N. Capitol St., NW, Suite 249, Washington, DC 20001, http://www.transportation.org.