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**Standard Specification for**

**Reinforced Concrete Culvert, Storm  
Drain, and Sewer Pipe [Metric]**

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**AASHTO Designation: M 170M-20**

**Technical Subcommittee: 4a, Concrete Drainage Structures**

**Release: Group 2 (June)**

**ASTM Designation: [C76M-16](#)**



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## 1. SCOPE

1.1. This specification covers reinforced concrete pipe intended to be used for the conveyance of sewage, industrial wastes, and storm water, and for the construction of culverts.

1.2. This specification is the metric counterpart of [M 170](#).

**Note 1**—This specification is a manufacturing and purchase specification only, and does not include requirements for bedding, backfill, or the relationship between field load condition and the strength classification of pipe. However, experience has shown that the successful performance of this product depends on the proper selection of the class of pipe, type of bedding and backfill, controlled manufacture in the plant, and care that installation conforms to the construction specifications. Owners of the reinforced concrete pipe specified herein are cautioned that they must correlate the field requirements with the class of pipe specified and provide inspection at the construction site.

**Note 2**—Attention is called to the specification for reinforced concrete D-load culvert, storm drain, and sewer pipe ([M 242M/M 242](#)).

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## 2. REFERENCED DOCUMENTS

2.1. *AASHTO Standards:*

- [M 6](#), Fine Aggregate for Hydraulic Cement Concrete
- [M 31M/M 31](#), Deformed and Plain Carbon and Low-Alloy Steel Bars for Concrete Reinforcement
- [M 80](#), Coarse Aggregate for Hydraulic Cement Concrete
- [M 85](#), Portland Cement
- [M 86M/M 86](#), Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe
- [M 154M/M 154](#), Air-Entraining Admixtures for Concrete
- [M 157](#), Ready-Mixed Concrete
- [M 170](#), Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe
- [M 194M/M 194](#), Chemical Admixtures for Concrete
- [M 240M/M 240](#), Blended Hydraulic Cement
- [M 242M/M 242](#), Reinforced Concrete D-Load Culvert, Storm Drain, and Sewer Pipe
- [M 262](#), Concrete Pipe and Related Products

- [M 295](#), Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete
- [M 302](#), Slag Cement for Use in Concrete and Mortars
- [M 336M/M 336](#), Steel Wire and Welded Wire, Plain and Deformed, for Concrete Reinforcement
- [T 280](#), Concrete Pipe, Manhole Sections, or Tile

2.2.

*ASTM Standards:*

- [A36/A36M](#), Standard Specification for Carbon Structural Steel
- [A706/A706M](#), Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement
- [C309](#), Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete
- [C1017/C1017M](#), Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete
- [C1116/C1116M](#), Standard Specification for Fiber-Reinforced Concrete

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### 3. TERMINOLOGY

- 3.1. *Definitions*—For definitions of terms relating to concrete pipe, see [M 262](#).

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### 4. CLASSIFICATION

- 4.1. Pipe manufactured in accordance with this specification shall be of five classes identified as Class I, Class II, Class III, Class IV, and Class V. The corresponding strength requirements are prescribed in Tables 1 to 5.

**Table 1**—Design Requirements for Class I Reinforced Concrete Pipe<sup>a</sup>

Reinforcement, cm <sup>2</sup> /Linear m of Pipe Wall										
Internal Designated Diameter, mm	Wall A					Wall B				
	Concrete Strength, 27.6 MPa					Concrete Strength, 27.6 MPa				
	Wall Thickness, mm	Circular Reinforcement <sup>b</sup>		Elliptical Reinforcement <sup>c</sup>		Wall Thickness, mm	Circular Reinforcement <sup>b</sup>		Elliptical Reinforcement <sup>c</sup>	
		Inner Cage	Outer Cage				Inner Cage	Outer Cage		
1500	125	5.3	3.2	5.9		150	4.4	2.6	4.9	
1650	138	6.4	3.8	7.0		163	5.3	3.2	5.9	
1800	150	7.4	4.4	8.3		175	6.1	3.7	6.8	
1950	163	8.5	5.1	9.3		188	6.8	4.1	7.6	
2100	175	9.5	5.7	10.6		200	7.8	4.7	8.7	
2250	188	10.4	6.2	11.4		213	8.7	5.2	9.7	
2400	200	11.4	6.8	12.7		225	9.7	5.8	10.8	
Concrete Strength, 34.5 MPa										
2250	213	13.3	8.0	Inner Circular Plus Elliptical	5.3 8.0	238	11.4	6.8	Inner Circular Plus Elliptical	4.6 6.8
2700	225	14.4	8.6	Inner Circular Plus Elliptical	5.8 8.6	250	12.9	7.7	Inner Circular Plus Elliptical	5.2 7.7
2850	<i>a</i>	—	—	—	—	<i>a</i>	—	—	—	—
3000	<i>a</i>	—	—	—	—	<i>a</i>	—	—	—	—
3150	<i>a</i>	—	—	—	—	<i>a</i>	—	—	—	—
3300	<i>a</i>	—	—	—	—	<i>a</i>	—	—	—	—
3450	<i>a</i>	—	—	—	—	<i>a</i>	—	—	—	—
3600	<i>a</i>	—	—	—	—	<i>a</i>	—	—	—	—

<sup>a</sup> For modified or special designs, see Section 7.2 or, with the permission of the owner, utilize the provision of M 242M/M 242. Steel areas may be interpolated between those shown for variations in diameter, loading, or wall thickness. Pipe more than 2400 mm in diameter shall have two circular cages or an inner circular cage plus one elliptical cage.

<sup>b</sup> As an alternative to designs requiring both inner and outer circular cages, the reinforcement may be positioned and proportioned in one of the following manners: (1) an inner circular cage plus an elliptical cage such that the area of the elliptical cage shall not be less than that specified for the outer cage in the table, and the total area of the inner circular cage plus the elliptical cage shall not be less than that specified for the inner cage in the table; (2) an inner and outer cage plus quadrant mats in accordance with Figure 1; or (3) an inner and outer cage plus an elliptical cage in accordance with Figure 2.

<sup>c</sup> Elliptical and quadrant steel must be held in place by means of holding rods, chairs, or other positive means throughout the entire casting operation.

Note: See Section 5 for basis of acceptance specified by the owner. The strength test requirements in newtons per linear meter of pipe under the three-edge-bearing method are listed below as the D-load (test load expressed in newtons per linear meter per millimeter of diameter) to produce the 0.3-mm crack and the ultimate load multiplied by the internal diameter of the pipe in millimeters. For acceptance testing requirements, see Section 11.3.1.

D-load to produce a 0.3-mm crack 40.0

D-load to produce the ultimate load 60.0