



Designation: A 979/A 979M – 97

AMERICAN SOCIETY FOR TESTING AND MATERIALS
100 Barr Harbor Dr., West Conshohocken, PA 19428
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Standard Specification for Concrete Pavements and Linings Installed in Corrugated Steel Structures in the Field¹

This standard is issued under the fixed designation A 979/A 979M; 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 the minimum material requirements and describes the procedures for installing concrete pavements and linings in corrugated steel pipes and structural plate structures in the field. Specific designs with additional or greater requirements shall be detailed in the contract documents. This specification is applicable to paving or lining new pipes and for rehabilitating existing structures. The pipe to be paved or lined is described in Specifications A 760/A 760M, A 761/A 761M, and A 762/A 762M.

1.2 This specification covers pipes 48 in. (1 200 mm) and larger for pavements and 24 in. (600 mm) and larger for full linings.

1.3 New pipes are to be designed in accordance with Practice A 796 and installed in accordance with Practice A 798 for factory-made pipes and Practice A 807 for structural plate structures. Structures to be rehabilitated shall be structurally stable.

1.4 Pipes with plant installed concrete pavements and linings are covered under Specification A 849.

1.5 This specification is applicable to product in either inch/pound units as A 979 or in SI units as A 979M. Inch/pound units and SI units are not necessarily equivalent. SI units are shown in brackets in the text for clarity, but they are the applicable values when materials are ordered to A 979M.

1.6 *This standard may involve hazardous materials, operations and equipment. The 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:

- A 185 Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement²
- A 615 Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement²
- A 760/A 760M Specification for Corrugated Steel Pipe,

Metallic-Coated for Sewers and Drains³

A 761/A 761M Specification for Corrugated Steel Structural Plate, Zinc-Coated, for Field-Bolted Pipe, Pipe-Arches, and Arches³

A 762/A 762M Specification for Corrugated Steel Pipe, Polymer Precoated for Sewers and Drains³

A 796 Practice for Structural Design of Corrugated Steel Pipe, Pipe-Arches, and Arches for Storm and Sanitary Sewers and Other Buried Applications³

A 798/A 798M Practice for Installing Factory-Made Corrugated Steel Pipe for Sewers and Other Applications³

A 807/A 807M Practice for Installing Corrugated Steel Structural Plate Pipe for Sewers and Other Applications³

A 849 Specification for Post-Applied Coatings, Pavings, and Linings for Corrugated Steel Sewer and Drainage Pipe³

A 902 Terminology Relating to Metallic Coated Steel Products³

C 31/C 31M Practice for Making and Curing Concrete Test Specimens in the Field⁴

C 33 Specification for Concrete Aggregates⁴

C 39 Test Method for Compressive Strength of Cylindrical Concrete Specimens⁴

C 150 Specification for Portland Cement⁵

C 309 Specification for Liquid Membrane-Forming Compounds for Curing Concrete⁴

C 595M Specification for Blended Hydraulic Cements⁵

C 618 Specification for Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete⁴

2.2 American Water Works Association Standards:

AWWA C 602 Standards for Cement-Mortar Lining of Water Pipelines—4 in. (100 mm) and larger—in place⁶

3. Terminology

3.1 *Definitions*—For definitions of general terms used in this specification, see Terminology A 902.

3.2 *Definitions of Terms Specific to This Standard:*

¹ This specification is under the jurisdiction of ASTM Committee A-05 on Metallic Coated Iron and Steel Products and is the direct responsibility of Subcommittee A05.17 on Corrugated Steel Pipe Specifications.

Current edition approved October 10, 1997. Published December 1998.

² Annual Book of ASTM Standards, Vol 01.04.

³ Annual Book of ASTM Standards, Vol 01.06.

⁴ Annual Book of ASTM Standards, Vol 04.02.

⁵ Annual Book of ASTM Standards, Vol 04.01.

⁶ Available from American Water Works Association, 6666 West Quincey Avenue, Denver, CO 80235.

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3.2.1 *contractor, n*—the installer or applicator of the concrete pavement of lining.

3.2.2 *engineer, n*—the designer of the work and its details.

3.2.3 *fabricator, n*—the producer of the pipe.

3.2.4 *lining, n*—for corrugated metal pipe, a layer of non-metallic material applied uniformly to the interior of a fabricated pipe, of sufficient thickness to fill and cover the corrugations.

3.2.5 *pavement, n*—for corrugated metal pipe, a lining applied only to a portion of the interior circumference, usually located in the lower portion (as the pipe is installed).

3.2.6 *purchaser, n*—the person or agency purchasing the finished product.

4. Requirements

4.1 *Concrete Pavements*—Concrete pavements shall be placed after the pipe has been installed and backfilled to final grade. Special pavement designs, which exceed the minimum requirements of this specification, shall be detailed in the job plans and specifications. In lieu of special designs, pavements shall extend over the area to be protected or rehabilitated. Invert pavements shall cover a minimum of the bottom 25 % of a round pipe's circumference and 40 % of the circumference of a pipe-arch (the invert of the pipe-arch), unless a special design is detailed in the plans and specifications.

4.1.1 The concrete for pavements shall have a minimum 28-day compressive strength of 3250 psi (22.4 MPa) when tested in accordance with Specification C 31 and Test Method C 39. The pavement shall have a minimum 3 in. (75-mm) thickness above the crests of the corrugations or structural plate bolts or nuts as applicable.

4.1.2 A minimum pavement thickness of 1-½ in. (38 mm) above the crests of the corrugations or structural plate bolts or nuts as applicable is required if concrete with a 28-day minimum compressive strength of 5 000 psi (34.5 MPa) when tested in accordance with Specification C 31 and Test Method C 39, is used.

NOTE 1—For rehabilitation applications, greater concrete pavement thicknesses may be required to replace necessary pipe ring compression strength lost due to service conditions.

4.2 *Concrete Linings*—Concrete linings shall be placed after the pipe has been installed and backfilled to final grade. Concrete linings shall cover 100 % of the circumference of round pipes.

4.2.1 The concrete for linings shall have a minimum 28-day compressive strength of 5 000 psi (34.5 MPa) when tested in accordance with Specification C 31 and Test Method C 39. The lining shall have a minimum thickness of ½ in. (3.2 mm) above the crests of the corrugations or structural plate bolts or nuts as applicable.

4.3 *Concrete Materials*—Concrete materials for pavements and linings shall consist of portland cement, fly ash (when used), aggregates and water. Special additives for air entrainment, sulfate resistance, etc., may be included as part of a specific mix design that meets or exceeds the requirements of this specification.

4.3.1 The cement for pavements shall be Type II portland cement conforming to Specification C 150 with an alkali

content not more than 0.60 % expressed as Na₂O.

4.3.2 The cement used for linings shall conform to the requirements of Specification C 150 for Type I or Type II.

4.3.3 Type IP portland Pozzolan cement conforming to Specification C 595 shall be permitted in concrete for pavements or linings, in lieu of the requirements of 4.3.1 or 4.3.2, if no fly ash is used in the mix.

4.3.4 Aggregates shall be clean, hard, and durable conforming to the requirements of Specification C 33 except that for concrete linings, the requirements for grading do not apply. For linings, the aggregates shall be well graded with 100 % passing the No. 16 (1.18 mm) sieve with no more than 5 % passing the No. 100 (150-µm) sieve.

4.3.5 Fly ash shall conform to the requirements of Specification C 618 for Class C or Class F. When used for pavements or linings, fly ash shall not exceed 20 % weight of the total cementitious materials in the mix.

4.3.6 Potable water shall be used.

4.3.7 Steel reinforcement, when required for pavements, shall be billet-steel bars conforming to Specification A 615, Grade 40 minimum or welded wire fabric reinforcement conforming to Specification A 185.

4.4 *Concrete Mix*—The concrete mix shall be uniform and homogeneous. The water content shall be the minimum quantity that produces a workable mixture with full allowance made for condensation forming on the interior of the pipe. The water-cement ratio of the mix shall not exceed 0.50 by weight.

NOTE 2—Guidance as to concrete mix consistency requirements for various types of equipment used to place full concrete linings is provided in the American Water Works Association (AWWA) C 602.

4.5 Surface Finish:

4.5.1 Pavements shall have a troweled or untroweled surface finish as specified in the contract documents. Full linings shall have a troweled surface finish.

4.5.1.1 Untroweled pavements shall be uniform and regular in appearance, meeting the requirements of 4.1 unless the plans and specifications require a specially roughened surface, energy dissipators, etc., to slow or impede flow.

NOTE 3—Concrete pavements including special surface roughening techniques (the placement of concrete bricks, blocks, etc., into the pavement to provide energy dissipating flow checks, etc.) are permitted. Such techniques must be detailed in the plans and specifications.

4.5.2 A troweled surface finish shall be accomplished using metal trowels and floats. The finished surface shall meet the requirements of 7.4.

4.6 Pipe Repairs:

4.6.1 When paving or lining new pipes, damaged pipe shall be replaced or repaired in accordance with the pipe Specifications A 760/A 760M, A 761/A 761M, or A 762/A 762M, as applicable.

4.6.2 Damaged or deteriorated pipes to be rehabilitated shall be repaired as directed by the engineer. Repairs are the responsibility of the paving or lining contractor or others as dictated by the contract documents.

5. Procedures

5.1 Cleaning and Preparation:

5.1.1 The interior surface areas of new pipes to be paved or