Designation: A 951/A 951M – 06

Standard Specification for Steel Wire for Masonry Joint Reinforcement[1]

This standard is issued under the fixed designation A 951/A 951M; 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 masonry joint reinforcement fabricated from cold-drawn steel wire. Joint reinforcement consists of longitudinal wires welded to cross wires.

1.2 The values stated in inch-pound or SI units are to be regarded as standard. Within the text the inch-pound units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system must be used independently of the other. Combining values may result in nonconformance with the specification.

2. Referenced Documents

2.1 *ASTM Standards:* [2]

A 82/A 82M Specification for Steel Wire, Plain, for Concrete Reinforcement

A 152/A 152M Specification for Wrought Iron Rivets and Rivet Rounds[3]

A 185/A 185M Specification for Steel Welded Wire Reinforcement, Plain, for Concrete

A 496/A 496M Specification for Steel Wire, Deformed, for Concrete Reinforcement

A 580/A 580M Specification for Stainless Steel Wire

A 641/A 641M Specification for Zinc–Coated (Galvanized) Carbon Steel Wire

3. Ordering Information

3.1 It shall be the responsibility of the purchaser to specify all requirements that are necessary for the manufacture and delivery of the wire under this specification. Such requirements to be considered include, but are not limited to, the following:

3.1.1 Quantity (metres [linear feet]),

3.1.2 Type (truss, ladder),

3.1.3 Width (nominal thickness of masonry wall),

3.1.4 Wire size and wire specification,

3.1.5 Finish (see Section 6),

3.1.6 Packaging (see Section 12), and

3.1.7 ASTM designation number and year of issue.

4. Materials and Manufacture

4.1 Wire used in the manufacture of masonry joint reinforcement shall be round and shaped and conform to the applicable provisions of Specification A 82/A 82M or A 580/A 580M, Type 304, except as modified herein.

4.2 Masonry joint reinforcement shall be assembled by automatic machines or by other suitable mechanical means that will assure accurate spacing and alignment of all members of the finished product.

4.3 Longitudinal and cross wires shall be securely connected at every intersection by an electric-resistance welding process that includes both fusion welding together with applied pressure to join the materials.

4.4 Longitudinal wires shall be deformed. One set of two deformations shall occur around the perimeter of the wire at a maximum spacing of 0.7 times the diameter or width of the wire, but not less than eight sets per 25 mm [1 in.] of length.

NOTE 1—Wire used for joint reinforcement is knurled to form deformations and as such it does not come under the deformation requirements in Specification A 496/A 496M.

5. Mechanical Requirements

5.1 *Tensile Properties*—Wire used in the fabrication of masonry joint reinforcement shall conform to the requirements of Table 1 based on nominal area of the wire.

5.2 *Tension Tests*:

5.2.1 Tension tests shall be made on individual wires cut from the finished product and tested either across or between the welds. No less than 50 % shall be across welds.

5.2.2 Tension tests across a weld shall have the welded joint located approximately at the center of the wire being tested.

5.2.3 Tensile strength shall be the average of four test values determined by dividing the maximum test load by the specified nominal cross-sectional area of the wire.

5.3 *Reduction of Area*—The ruptured section of the tensile specimen is measured to determine this property. The measurement shall be made only when rupture has occurred at a sufficient distance from the center of the weld to permit an accurate measurement of the fractured section. Additional

[1] This specification is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel, and Related Alloys and is the direct responsibility of Subcommittee A01.05 on Steel Reinforcement.

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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] Withdrawn.

***A Summary of Changes section appears at the end of this standard.**

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TABLE 1 Tension Test Requirements

Tensile strength, min, MPa [ksi]	550 [80]
Yield strength, min, MPa [ksi]	485 [70]
Reduction of area, min, %	30

testing is permitted when a suitable ruptured section is not obtained from the initial test. The wire shall meet the minimum reduction of area requirements of Table 1.

5.4 *Weld Shear Strength*—The weld shear strength in Newtons shall not be less than 172 multiplied by the nominal area in square millimetres [or in pounds-force shall not be less than 25 000 multiplied by the specified nominal area of the larger wire in square inches].

NOTE 2—Since industry practice is to use butt welds in the manufacture of joint reinforcement, the weld shear strength in pounds-force is prescribed as 25 000 times the area of the larger wire rather than 35 000 times the area of the larger wire.

5.5 *Weld Shear Strength Tests*:

5.5.1 Test specimens shall be obtained from the finished product by cutting a section of longitudinal wire that includes one weld.

5.5.2 Weld shear strength tests shall be conducted using a fixture of such design as to prevent rotation of the cross wire. The cross wire shall be placed in the anvil of the testing device which is secured in the tensile machine and the load then applied to the longitudinal wire.

5.5.3 Weld shear strength shall be the average test load in Newtons [pounds] of four test specimens selected at random.

5.6 *Bend Tests*:

5.6.1 Test specimens shall be obtained from the fabricated product by cutting a section of longitudinal wire without welds.

5.6.2 The test specimens shall be bent at room temperature through 180° around a pin, the diameter of which is equal to the nominal diameter of the specified wire. Shaped wires shall be placed on the pin so that the minimum dimension is perpendicular to the axis of the pin.

5.6.3 The specimen shall not break nor shall there be visible cracks of the base metal on the outside diameter of the bend.

6. Other Requirements

6.1 When corrosion protection of joint reinforcement is provided, it shall be in accordance with one of the following:

6.1.1 *Mill Galvanized*—Zinc coated, in accordance with the hot-dip method of Specification A 641, with a minimum of 30 g/m^2[0.1 oz per sq. ft.] of surface area. It shall be permissible to apply the coating before fabrication.

6.1.2 *Hot-Dip Galvanized*—Zinc coated, by the hot-dip method, in accordance with Specification A 153/A 153M, Class B (average zinc coating of 458 g/m^2 [1.50 oz per sq. ft.]). The coating shall be applied after fabrication.

7. Dimensions and Tolerances

7.1 *Longitudinal Wires*—The minimum size of longitudinal wires shall be MW7 [W1.1].

7.2 *Cross Wires*—The minimum size of cross wires shall be MW7 [W1.1]. Cross wires shall not project beyond the outside longitudinal wires by more than 3 mm [⅛ in.].

7.3 *Width*—The width of joint reinforcement is defined as the out-to-out distance of outside longitudinal wires. Width shall not vary by more than 3 mm [⅛ in.] from the manufacturer's specified standard dimension. Width shall be measured as follows:

7.3.1 *Ladder Type Joint Reinforcement*— At opposite weld points, and

7.3.2 *Truss Type Joint Reinforcement*— From a weld point on one longitudinal wire perpendicular to a point on the opposite wire between adjacent weld points.

7.4 *Length*—The length of pieces of joint reinforcement shall not vary by more than 13 mm [½ in.] from the specified length.

7.5 *Dimensions*:

7.5.1 The required dimensions shall be measured on three samples of joint reinforcement prior to galvanizing or on three samples from which the galvanizing has been removed.

7.5.2 Measure the dimensions of both longitudinal and cross wires to the nearest 0.030 mm [0.001 in.].

7.5.3 Measure the gaps between the ends of deformations around the circumference of the wire to the nearest 0.030 mm [0.001 in.].

8. Number of Tests

8.1 *Number of Tests*—One set of each test described herein shall be performed for each 91 500 m [300 000 linear feet] of joint reinforcement, but not less than one set each week.

9. Inspection

9.1 The inspector representing the purchaser shall have free entry at all times, while work on the contract of the purchaser is being performed, to all parts of the manufacturer's facilities that concern the manufacture of the material ordered. The manufacturer shall afford the inspector all reasonable facilities to assure that the material is being furnished in accordance with this specification.

9.2 Except for yield strength, all tests and inspections shall be made at the place of manufacture prior to shipment, unless otherwise specified. Such tests shall be conducted so as not to interfere unnecessarily with the operation of the facilities.

9.3 If the purchaser considers it desirable to determine compliance with the strength requirements of Specification A 82, tension tests shall be made by a recognized laboratory, or by the wire supplier, observed by the purchaser's representative if desired, provided such tests do not interfere unnecessarily with manufacturing operations.

10. Rejection and Rehearing

10.1 Material that does not meet the requirements of this specification, shall be subject to rejection. Unless otherwise specified, any rejection shall be reported to the manufacturer within five days from the time of selection of test specimens.

10.2 In case a specimen fails to meet the tension or bend test, the material shall not be rejected until two additional specimens taken from other wires in the same bundle have been tested. The material shall be considered as meeting the specification in respect to any prescribed tensile property, provided the tested average for the three specimens, including

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the specimen originally tested, is equal to or exceeds the required minimum for the particular property in question, and further provided that none of the three specimens develops less than 80 % of the required minimum for the tensile property in question. The material shall be considered as meeting this specification in respect to bend test requirements provided both additional specimens satisfactorily pass the prescribed bend test.

10.3 Any material that is found not to meet the requirements of this specification subsequent to its acceptance at the manufacturer's facilities shall be subject to rejection and the manufacturer shall be notified promptly.

10.4 Welded joints shall withstand normal shipping and handling without becoming broken, but the presence of broken welds, regardless of cause, shall not constitute cause for rejection unless the number of broken welds per bundle exceeds 1 % of the total number of joints in a bundle.

10.5 In the event of rejection because of failure to meet the weld shear requirements, four additional specimens shall be taken from four different bundles and tested in accordance with 5.5. If the average of all the weld shear tests performed does not meet the requirement, the material shall be rejected.

10.6 In the event of rejection because of failure to meet the requirements for dimensions, the amount of material rejected shall be limited to those bundles which fail to meet this specification.

10.7 Rust, surface seams, or surface irregularities will not be cause for rejection provided the minimum dimensions, cross-sectional area, and tensile properties of a hand wire brushed test specimen are not less than the requirements of this specification.

10.8 *Rehearing*—Rejected materials shall be preserved for a period of at least two weeks from the date of inspection, during which time the manufacturer shall have the option to make claim for a rehearing and retesting.

11. Certification

11.1 If outside inspection is waived, a manufacturer's certification that the material has been tested in accordance with and meets the requirements of this specification shall be the basis of acceptance of the material. The certification shall include the specification number, year-date of issue, and revision letter, if any.

11.2 A material test report, certificate of inspection, or similar document printed from or used in electronic form from an electronic data interchange (EDI) transmission shall be regarded as having the same validity as a counterpart printed in the certifier's facility. The content of the EDI transmitted document must meet the requirements of the invoked ASTM standard(s) and conform to any existing EDI agreement between the purchaser and the supplier. Notwithstanding the absence of a signature, the organization submitting the EDI transmission is responsible for the content of the report.

NOTE 3—The industry definition as invoked here is: EDI is the computer-to-computer exchange of business information in a standard format such as ANSI ASC X12.

12. Packaging and Marking

12.1 Joint reinforcement shall be assembled in bundles containing 75 to 150 metres [250 to 500 linear ft.] and securely fastened together.

12.2 Each bundle shall have attached thereto a suitable tag bearing the name of the manufacturer, description of the material, ASTM A 951, and other such information as specified by the purchaser.

13. Keywords

13.1 cross wires; deformed; galvanized wire; hot-dipped galvanized; joint reinforcement; ladder type; longitudinal wires; tensile properties; truss type; weld shear strength

APPENDIX

(Nonmandatory Information)

X1. WELD SHEAR TESTING

X1.1 *Scope*—This appendix provides information leading to a better understanding of the purpose and significance of the weld shear strength provisions of this specification.

X1.2 *Background*—Joint reinforcement has been used in the masonry industry since 1940. For most of the period since then, its manufacture has been limited to a relatively small group of producers and users who simply referred to "manufacturers' recommendations" as the standard of quality and acceptance. With the adoption of a new consensus standard for the design of masonry, it became clear that a standard for the manufacture of joint reinforcement was needed. In developing this standard it was decided to use a format similar to that used for the ASTM Standard for Welded Wire Reinforcement, Plain, for Concrete, Specification A 185/A 185M, since many people had the notion that joint reinforcement was used in a manner similar to wire mesh. A significant difference between wire mesh and joint reinforcement arose when an attempt was made to fashion the requirements for weld shear strength after those in Specification A 185/A 185M.

X1.3 *Manufacturing Differences*—Welded wire reinforcement is manufactured with lap welds while almost all of the manufacturers of joint reinforcement use butt welds so that the total thickness of material at a weld is as small as possible. This is important since there is not much room to install joint reinforcement in conventional mortar bed joints. In addition, virtually all of the welded wire reinforcement manufactured is square or rectangular with intersecting wires perpendicular to each other. This is not the case with joint reinforcement where

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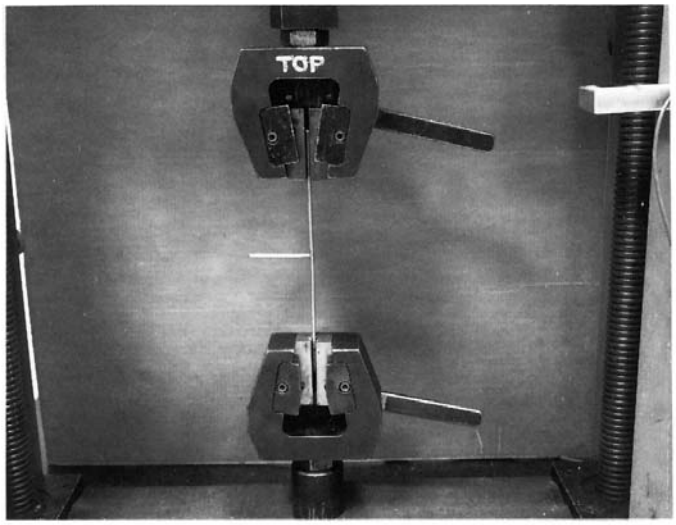
the majority of product is produced with a "truss" configuration. Compounding the difference is the fact that the angle of intersection varies for each different width of product produced since the pitch between welds is a constant 400 mm [16 in.].

X1.4 *Weld Tests*—Because the shape of truss type joint reinforcement is so variable, the established weld shear test method in A 185/A 185M and does not apply and reference to it has caused problems. It was decided that the best way to handle the testing was to omit any description of the test setup and to simply state the minimum acceptable weld strength, recognizing that this is the method used by manufacturers to ensure that they are producing "satisfactory welds." For ladder type joint reinforcement, manufacturers use a setup similar to the weld tester described in A 185/A 185M (see Fig. X1.1 and Fig. X1.2). For truss type, the method used is to attach the opposite jaws of a testing machine to the longitudinal and diagonal wires as shown in Fig. X1.3 and Fig. X1.4. The strength of the weld used to connect longitudinal and diagonal wires of truss type joint reinforcement is not critical.



a

FIG. X1.1 Test Set-up for Ladder-Type Joint Reinforcement (a)

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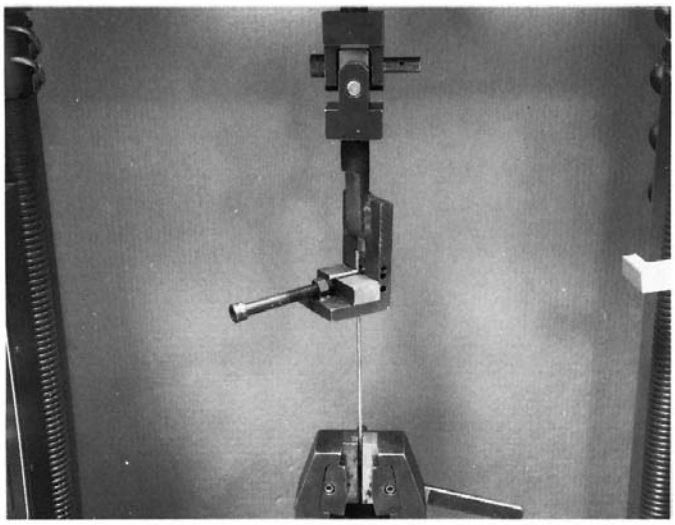

b

FIG. X1.2 Test Set-up for Ladder-Type Joint Reinforcement (b)

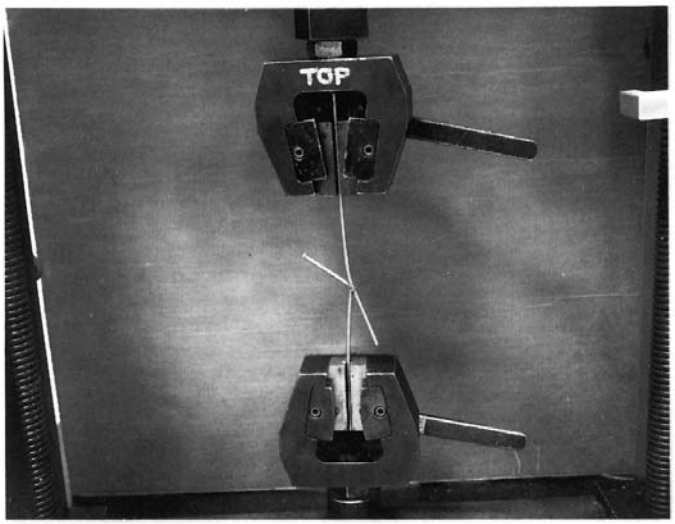

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FIG. X1.3 Test Set-up for Truss-Type Joint Reinforcement (a)

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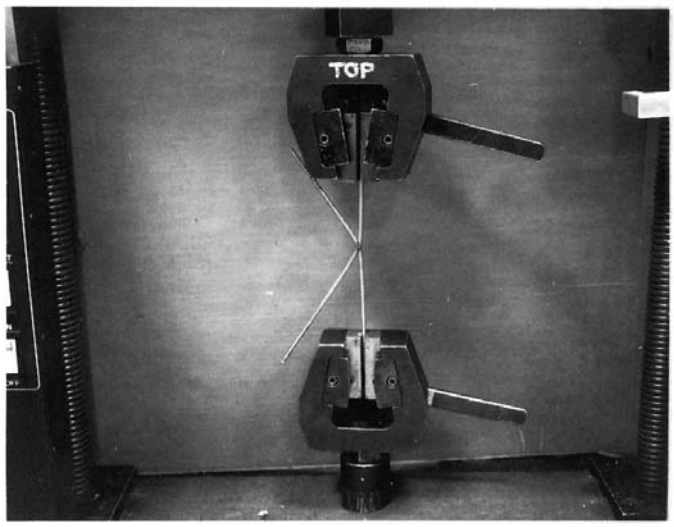

b

FIG. X1.4 Test Set-up for Truss-Type Joint Reinforcement (b)

SUMMARY OF CHANGES

Committee A01 has identified the location the location of selected changes to this standard since the last version (A 951–02) that may impact the use of this standard.

(1) Permissive language was removed throughout the standard.

(2) Language was revised throughout the standard to show SI units as primary.

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