



Designation: A 497 – 01

Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete¹

This standard is issued under the fixed designation A 497; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

This standard has been approved for use by agencies of the Department of Defense.

1. Scope

1.1 This specification covers welded wire reinforcement made from cold-worked drawn or rolled deformed wire, or a combination of deformed and non-deformed wires, to be used for the reinforcement of concrete.

NOTE 1—Welded wire for concrete reinforcement has been described by various terms: welded wire fabric, WWF, fabric, and mesh. The wire reinforcement industry prefers the term “welded wire reinforcement” (WWF) as being more representative of the range of products being manufactured. Therefore, the term “welded wire fabric” has been replaced with the term “welded wire reinforcement” in this specification and in other related specifications.

1.2 The values stated in either inch-pound or SI units are to be regarded as the standard. Within the text the inch-pound units are shown in parenthesis. 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:

A 82 Specification for Steel Wire, Plain, for Concrete Reinforcement²

A 496 Specification for Steel Wire, Deformed, for Concrete Reinforcement²

A 700 Practices for Packaging, Marking, and Loading Methods for Steel Products for Domestic Shipment³

2.2 Military Standards:

MIL-STD-129 Marking for Shipment and Storage⁴

MIL-STD-163 Steel Mill Products Preparation for Shipment and Storage⁴

2.3 Federal Standard:

Fed. Std. No. 123 Marking for Shipments (Civil Agencies)⁴

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 Annual Book of ASTM Standards, Vol 01.04.

³ Annual Book of ASTM Standards, Vol 01.05.

⁴ Available from Standardization Documents Order Desk, Building 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094.

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *convoluted wire, n*—when wire for welded wire reinforcement is shaped into a sinusoidal wave shape, it is commonly referred to as convoluted wire. The wire is used in the manufacture of cages for certain applications of concrete pipe reinforcing. Only non-deformed wire is normally subject to convolution.

3.1.2 *welded wire reinforcement, n*—as used within the scope and intent of this specification, welded wire reinforcement designates a material composed of cold-worked steel wire, fabricated into sheets or rolls by the process of electric resistance welding. The finished material shall consist essentially of a series of longitudinal and transverse wires arranged substantially at right angles to each other, and welded together at points of intersection.

4. Ordering Information

4.1 Orders for material to this specification should include the following information:

4.1.1 Quantity (weight or square area),

4.1.2 Name of material (deformed welded wire reinforcement for concrete),

4.1.3 Wire spacings and sizes,

4.1.4 Minimum yield strength if Supplement S1 of Specification A 496 applies; and minimum yield strength if wire conforming to Specification A 82 is to be used and Supplement S1 of Specification A 82 applies.

4.1.5 Exclusion of over-steeling, if required (see 9.4.1),

4.1.6 Length and width of sheets or rolls,

4.1.7 Packaging (see Section 16), and

4.1.8 ASTM designation and year of issue.

NOTE 2—A typical ordering description is as follows: 10 000 ft² welded deformed wire reinforcement for concrete, 6 × 12–D6 × D2, in flat sheets 96 in. wide by 240 in. long, in secured lifts, to ASTM A 497 – ____.

5. Materials

5.1 The wire used in the manufacture of welded wire reinforcement shall conform to Specification A 496 and its Supplement S1 if so ordered, either solely or in combination with wire conforming to Specification A 82 and its Supplement S1 if so ordered.

5.2 Welded wire reinforcement shall be furnished either in flat sheets, or in rolls, as specified by the purchaser.

6. Manufacture

6.1 The wires shall be assembled by automatic machines or by other suitable mechanical means which will assure accurate spacing and alignment of all wires of the finished welded wire reinforcement.

6.2 Longitudinal and transverse wires shall be securely connected at every intersection by a process of electrical-resistance welding which employs the principle of fusion combined with pressure.

6.3 Wire of proper grade and quality when fabricated in the manner herein required shall result in a strong, serviceable mat-type product having substantially square or rectangular openings. It shall be fabricated and finished in a workmanlike manner, shall be free of injurious defects, and shall conform to this specification.

NOTE 3—A variation of manufacturing includes the application of one or more longitudinal convoluted wires at one edge of welded wire reinforcement for concrete pipe reinforcing cages. This shape allows the cage ends to be expanded to a larger diameter to accommodate the bell-shaped ends of concrete pipe.

7. Mechanical Property Requirements

7.1 *Tensile*—Wire for the production of welded wire reinforcement, deformed, is described in Specification A 496. Tensile tests may be made on wire cut from the welded wire reinforcement and tested either across or between the welds; no less than 50 % shall be across welds. Tensile tests across a weld shall have the welded intersection located approximately at the center of the wire being tested and the cross wire forming the welded intersection shall extend approximately 25 mm (1 in.) beyond each side of the welded intersection.

NOTE 4—Tensile and bend testing are normally done at the time wire is drawn. The manufacturer's finished product still must satisfy the mechanical properties when tested after fabrication.

7.2 *Bend Test*—The wire shall withstand the bend test as described in Specification A 496 and shall be performed on a specimen taken from between the welds.

7.3 *Weld Shear Strength*—The weld shear strength between longitudinal and transverse wires shall be tested as described in Section 8. The minimum average shear value in pounds-force shall not be less than 35 000, multiplied by the nominal area of the larger wire in square inches (or in Newtons, shall not be less than 241, multiplied by the nominal area in square millimetres), where the smaller wire is not less than size D4 and has an area of 40 % or more of the area of the larger wire.

7.3.1 Welded wire reinforcement having a relationship of larger and smaller wires other than that covered in 7.3 shall

meet an average weld shear strength requirement of not less than 3.6 kN (800 lbf) provided that the smaller wire is not smaller than D4.

7.3.2 Weld-shear tests for determination of conformance to the requirements of 7.3 shall be conducted using a fixture as described in Section 8.

7.3.3 Four welds selected at random from the specimen described in 11.2 shall be tested for weld shear strength. The transverse wire of each test specimen shall extend approximately 25 mm (1 in.) on each side of the longitudinal wire. The longitudinal wire of each test specimen shall be of such length below the transverse wire so as to be adequately engaged by the grips of the testing machine. It shall be of such length above the transverse wire that its end shall be above the center line of the upper bearing of the testing device.

7.3.4 The material shall be deemed to conform to the requirements for weld shear strength if the average of the four samples complies with the value stipulated in 7.3. If the average fails to meet the prescribed value, all the welds across the specimen shall then be tested. The welded wire reinforcement will be acceptable if the average of all weld shear test values across the specimen meets the prescribed minimum value.

8. Weld Shear Test Apparatus and Methods

8.1 As the welds in welded wire reinforcement contribute to the bonding and anchorage value of the wires in concrete, it is imperative that the weld acceptance tests be made in a jig which will stress the weld in a manner similar to which it is stressed in concrete. In order to accomplish this, the vertical wire in the jig must be stressed in an axis close to its center line. Also the horizontal wire must be held closely to the vertical wire, and in the same relative position, so as to prevent rotation of the horizontal wire. When the welded wire reinforcement is designed with different wire sizes, the larger diameter wire is the "vertical wire" when tested (see Fig. 1⁵).

8.2 Fig. 1 shows the details of a typical testing jig together with two anvils which make it possible to test welds for wire up to 15.9 mm (0.625 in.) in diameter. This testing jig can be used in most tension testing machines and should be hung in a ball and socket arrangement at the center of the machine. This, or a similarly effective fixture designed on the same principle, is acceptable.

8.3 Test specimens should be inserted through the notch in the anvil using the smallest notch available in which the vertical wire will fit loosely. The vertical wire shall be in contact with the surface of the free rotating rollers while the horizontal wire shall be supported by the anvil on each side of the slot. The bottom jaws of the testing machine shall grip the lower end of the vertical wire and the load shall be applied at a rate of stressing not to exceed 689 MPa/min (100 ksi/min).

9. Dimensions

9.1 *Width*—The width of welded wire reinforcement shall be considered to be the center-to-center distance between

⁵ A detailed drawing showing complete dimensions of the testing jig may be obtained from ASTM Headquarters. Request ADJA0185.

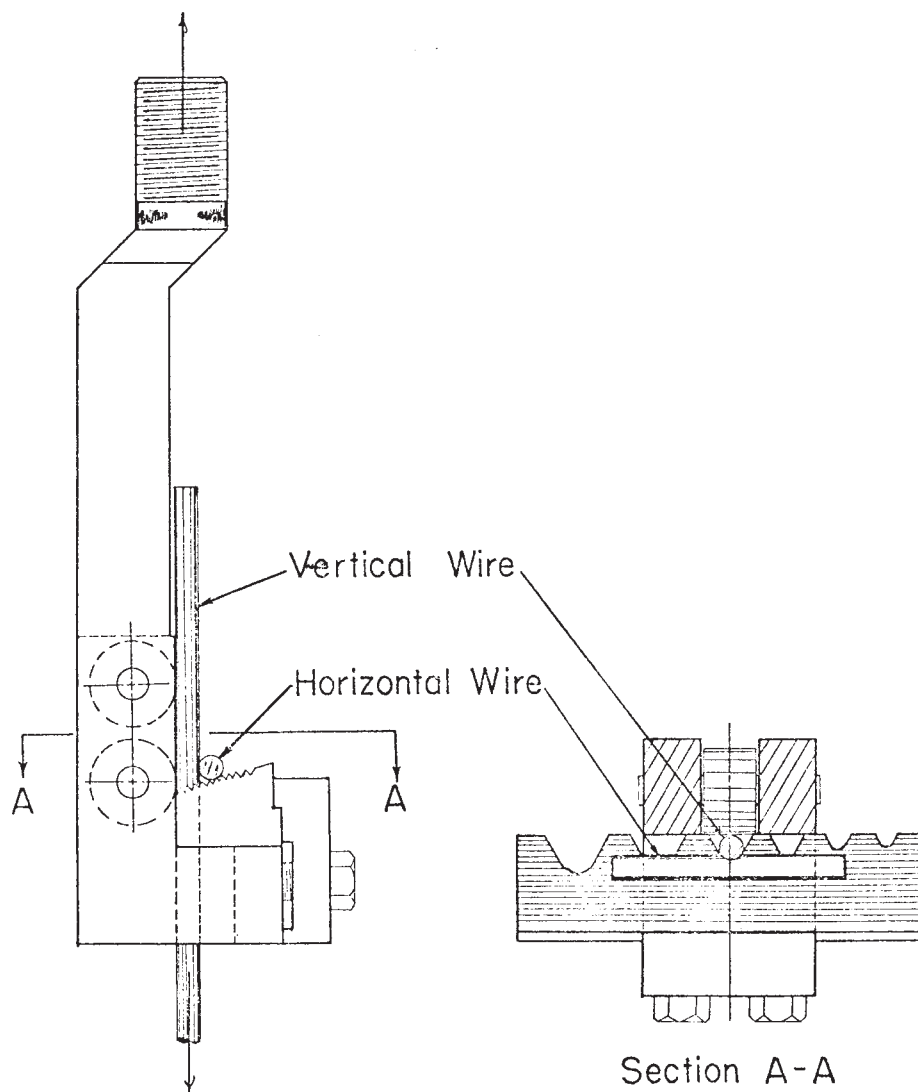


FIG. 1 Welded Wire Reinforcement Weld Tester

outside longitudinal wires. The permissible variation shall not exceed 13 mm (0.5 in.) greater or less than the specified width. In case the width of flat sheets or rolls is specified as the overall width (tip-to-tip length of cross wires), the width shall not vary more than ± 25 mm (± 1 in.) from the specified width. When measurements involve a convoluted wire, the measurement shall be made to the approximate center of the sinusoidal wave shape.

9.2 *Length*—The overall length of flat sheets, measured on any wire, may vary ± 25 mm (± 1 in.), or 1 %, whichever is greater.

9.3 Overhang of the transverse wires shall not project beyond the centerline of each longitudinal edge wire more than a distance of 25 mm (1 in.), unless otherwise specified. When transverse wires are specified to project a specific length beyond the center line of a longitudinal edge wire, the permissible variation shall not exceed 13 mm (0.5 in.) greater or less than the specified length.

9.4 The permissible variation in weight of any wire in the finished welded wire reinforcement shall conform to the tolerances prescribed for the wire before fabrication, in Specification A 496, with the following exceptions:

9.4.1 Unless otherwise precluded by the purchaser, the manufacturer will be permitted to apply over-sized wire (not under-sized). The size differential shall not exceed one “D” size increment on sizes D8 and smaller, and two “D” size increments on sizes larger than D8. In all cases where such over-steeling is practiced, the producer shall identify the welded wire reinforcement with the style originally ordered.

9.5 The average spacing of wires shall be such that the total number of wires contained in a sheet or roll is equal to or greater than that determined by the specific spacing, but the center-to-center distance between individual members may vary not more than 6.35 mm (0.25 in.) from the specified spacing. It is understood that sheets of welded wire reinforcement of the specified length may not always contain an

identical number of transverse wires and, therefore, may have various lengths of longitudinal overhang.

10. Workmanship

10.1 Wire of proper grade and quality, when fabricated in the manner herein required, shall result in a strong, serviceable mat-type product having substantially square or rectangular openings. It shall be fabricated and finished in a workmanlike manner, as determined by visual inspection, and shall conform to this specification.

11. Sampling

11.1 Test specimens for testing mechanical properties shall be obtained by cutting from the finished welded wire reinforcement, a full width section, of sufficient length to perform testing described in 7.1 and 7.2.

11.2 Test specimens for determining weld-shear properties shall be obtained by cutting from the finished welded wire reinforcement, a full width section of sufficient length to perform testing described in 7.3.3.

11.3 Measurements for conformance to dimensional characteristics shall be made on full sheets or rolls.

11.4 If any test specimen exhibits obvious imperfections, it may be discarded and another specimen substituted.

12. Number of Tests

12.1 One test for conformance to tensile strength and bend requirements shall be made for each 6 968 m²(75 000 ft²) of welded wire reinforcement or remaining fraction thereof. For testing prior to fabrication, one test for each 18 Mg (20 tons) of wire shall be made.

12.2 One test for conformance to weld shear strength requirement shall be made for each 27 870 m²(300 000 ft²) of welded wire reinforcement or remaining fraction thereof.

13. Inspection

13.1 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 works 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.

13.2 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 so conducted as not to interfere unnecessarily with the operation of the works.

13.3 If the purchaser considers it desirable to determine compliance with the yield strength requirements of Specification A 496, yield strength tests may be made in a recognized laboratory, or their representative may make the test at the mill, if such tests do not interfere unnecessarily with the mill operations.

13.4 *For U.S. Government Procurement Only*—Except as otherwise specified in the contract, the contractor is responsible for the performance of all inspection and test requirements specified herein. Except as otherwise specified in the contract, the contractor may use his own or any other suitable facilities for the performance of the inspection and test requirements

specified herein, unless disapproved by the purchaser at the time of purchase. The purchaser shall have the right to perform any of the inspections and tests at the same frequency as set forth in this specification where such inspections are deemed necessary to assure that material conforms to prescribed requirements.

14. Rejection and Retests

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

14.2 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 sheet or roll 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 the specimen originally tested, is equal to or exceeds the required minimum for the particular property in question and provided further 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.

14.3 Any material that shows injurious imperfections subsequent to its acceptance at the manufacturer's works may be rejected and the manufacturer shall be promptly notified.

14.4 Welded intersections 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 sheet exceeds 1 % of the total number of intersections in a sheet, or if the material is furnished in rolls, 1 % of the total number of intersections in 14 m² (150 ft²) of welded wire reinforcement and, furthermore, provided not more than one half the permissible maximum number of broken welds are located on any one wire.

14.5 In the event of rejection because of failure to meet the weld shear requirements, four additional specimens shall be taken from four different sheets or rolls and tested in accordance with Section 8. If the average of all the weld shear tests performed does not meet the requirement, the material shall be rejected.

14.6 In the event of rejection because of failure to meet the requirements for dimensions, the amount of material rejected shall be limited to those individual sheets or rolls which fail to meet this specification.

14.7 Rust, surface seams, or surface irregularities shall not be cause for rejection provided the minimum welded wire reinforcement dimensions, cross-sectional area, tensile properties, and weld shear strength of a hand wire-brushed test specimen are not less than the requirements of this specification. The height of deformations above the minimum height requirements (see Specification A 496) shall not be cause for rejection.

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

15. Certification

15.1 If outside inspection is waived, a manufacturer's certification that the material has been manufactured 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.

15.2 This conformance is predicated upon testing and acceptance of wire prior to fabrication, coupled with random shear testing during production. Because of warehousing and stocking problems, no efforts are normally taken to supply actual test data on material shipped. If this is deemed essential, outside inspection should be utilized.

15.3 When Supplement S1 of Specifications A 82 or A 496 is specified for the material, test results for yield strength, tensile strength, and bend tests shall be reported (S1.3.1 of Specification A 82, S1.3.1 of Specification A 496).

16. Packaging and Marking

16.1 Unless otherwise specified, packaging, marking, and loading for shipment shall be in accordance with Practices A 700.

16.2 When welded wire reinforcement is furnished in flat sheets, it shall be assembled in bundles of convenient size containing not more than 150 sheets and securely fastened together.

16.3 When welded wire reinforcement is furnished in rolls, each roll shall be secured so as to prevent unwinding during shipping and handling.

16.4 Each bundle of flat sheets and each roll shall have attached thereto a suitable tag bearing the name of the manufacturer, description of the material, ASTM A 497, and such other information as may be specified by the purchaser.

16.5 When specified in the contract or order, and for direct procurement by or direct shipment to the U.S. government, when Level A is specified, preservation, packaging, and packing shall be in accordance with the Level A requirement of MIL-STD-163.

16.6 When specified in the contract or order, and for the direct procurement by or direct shipment to the U.S. government, marking for shipment, in addition to requirements specified in the contract or order, shall be in accordance with MIL-STD-129 for U. S. military agencies and in accordance with Fed. Std. No. 123 for U. S. government civil agencies.

17. Keywords

17.1 concrete reinforcement; deformed steel wire; reinforcing steels; reinforced concrete; welded wire reinforcement

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