

MIL-W-3795B

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Superseding

MIL-W-3795A

30 July 1957

MILITARY SPECIFICATION

WIRE, ELECTRICAL (TINSEL)

This specification is mandatory for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. - This specification covers uninsulated tinsel electrical wire used in the manufacture of tinsel electrical cord, where extreme flexibility is required.

1.2 Classification. - This specification covers the types of tinsel electrical wire listed in table I, as specified. (See 6.2.)

Table I. Tinsel electrical wire.

Type	Overall diameter	Breaking load minimum
	<u>Inch</u>	<u>Pounds</u>
I	0.040 \pm 0.002	43
II032 \pm .002	25
III025 \pm .002	13
IV022 \pm .002	10

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal form a part of this specification to the extent specified herein.

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SPECIFICATIONS

Military

MIL-C-572 - Cords, Yarns and Monofilaments - Organic Synthetic Fiber.

MIL-C-45662 - Calibration System Requirements.

STANDARDS

Military

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.

(Copies of specifications and standards required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 Material.

3.1.1 Tinsel ribbon. - Tinsel ribbon shall be made by rolling wire into a flat ribbon of uniform cross section. For use in type I wire, AWG size 37 hard-drawn bronze wire shall be used, and for types II, III, IV, AWG size 40 hard-drawn cadmium copper wire shall be used. When specified (see 6.2), the ribbon shall be coated with a continuous and uniform coating of silver or tin. Ribbon sizes shall be in accordance with table II.

Table II. Ribbon sizes.

Dimension	For type I wire	For types II, III, and IV wire
Width, range, inclusive, inch	0.015 to 0.020	0.007 to 0.011
Thickness, range, inclusive, inch	.0009 to .0013	.0008 to .0012

3.1.1.1 Performance requirements. - The ribbon shall meet the performance requirements specified in table III. (See 4.5.2 to 4.5.4, incl.)

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Table III. Performance requirements for ribbon.

Performance characteristic	For type I wire	For types II, III, and IV wire
Breaking load, minimum, ounces.	19.4	11
DC resistance, at 20°C, range, inclusive, ohms per foot.	0.5 to 1.3	0.8 to 1.5
Bending, minimum, number of bends.	750	1,000

3.1.2 Strand and core yarns. - The synthetic ply yarn of the strand (see 3.2.1) and of the wire core (see 3.2.2) shall conform to type SAR of MIL-C-572, except that for type IV, these yarns shall be polyaryl amide fiber, Du Pont "Nomex", or equal; short fiber spun yarn may be used for under 200 denier. However, other types of synthetic-textile materials may be substituted, if approved by the agency or service concerned. Vegetable and sulfonated oils shall not be used as lubricants in the processing of rayon.

3.1.2.1 Conductivity of strand and core yarns. - The conductivity of a solution prepared from the yarns of the strands and wire core, removed from the finished (but uninsulated) wire, shall not exceed 50 micromhos per centimeter cube at 20°C. (See 4.5.5.)

3.2 Construction.

3.2.1 Tinsel strand. - Two ribbons shall be evenly wound in a double layer about a synthetic ply-yarn strand. The first layer of the ribbon shall lie flat against the strand yarn and the second layer of ribbon shall lie flat against the first layer of ribbon. Adjacent turns of each ribbon shall lie flat and the adjacent edges shall not touch nor overlap. Strand construction shall also be in accordance with table IV.

Table IV. Strand construction.

Construction	For type I wire	For type II wire	For type III wire	For type IV wire
Strand yarn	450 denier or equivalent	270 denier or equivalent	150 denier or equivalent	200 denier or equivalent (polyaryl amide)
Direction of lay	Right hand	Left hand	Right hand	Right hand
Number of turns of ribbon per inch of strand yarn, minimum*	29	48	48	39

*Measured over any 6-inch portion.

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3.2.2 Tinsel electrical wire. - Wire construction shall be in accordance with table V. Six strands (see 3.2.1) for types I, II and III wire, and four strands for type IV wire, shall be evenly wound in a single layer about a synthetic ply-yarn core. (See 3.1.2.) For type IV wire construction, the synthetic ply-yarn center strand may be omitted at the discretion of the supplier.

Table V. Wire construction.

Construction	For type I wire	For type II wire	For type III wire	For type IV wire
Core yarn	270 denier, 4 ply, or equivalent	270 denier, 3 ply, or equivalent	150 denier, 3 ply, or equivalent	100 denier, or equivalent (polyaryl amide)
Direction of lay . .	Left hand	Right hand	Left hand	Left hand
Number of turns of each strand per inch of core yarn, range, inclusive	2.0 to 3.0	2.5 to 3.25	2.0 to 3.0	2.0 to 5.0
Overall wire diameter, inch	0.040 ± 0.002	0.032 ± 0.002	0.025 ± 0.002	0.022 ± 0.002

3.2.2.1 Performance requirements. - The wire shall meet the performance requirements in table VI. (See 4.5.2 and 4.5.3.)

Table VI. Performance requirements for wire.

Performance characteristic	Type I	Type II	Type III	Type IV
Breaking load, minimum, pounds.	43	25	13	10
DC resistance, at 20°C, maximum, ohms per foot.	0.28	0.25	0.25	0.27

3.3 Workmanship. - Tinsel electrical wire shall be manufactured and processed in a careful and workmanlike manner, in accordance with good design and sound practice. The wire shall be uniform in appearance, shall be free from injurious defects, and shall contain no visible splits, nicks, or slivers.

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4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. - Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the government. The government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.1.1 Test equipment and inspection facility. - Inspection equipment and test facilities shall be established and maintained in accordance with MIL-C-45562.

4.2 Classification of inspection. - Inspection shall be classified as follows:

- (a) Materials inspection. (See 4.3.)
- (b) Quality conformance inspection. (See 4.4.)

4.3 Materials inspection. - Materials inspection shall consist of certification supported by verifying data that the materials listed in table VII, used in fabricating the tinsel wire, are in accordance with the applicable referenced specification or requirement prior to such fabrication.

Table VII. Materials inspection.

Material	Requirement paragraph	Applicable specification
Tinsel ribbon	3.1.1	- - - - -
Strand and core yarns	3.1.2	MIL-C-572

4.4 Quality conformance inspection.

4.4.1 Inspection of product for delivery. - Inspection of product for delivery shall consist of groups A and B inspection.

4.4.1.1 Inspection lot. - An inspection lot shall consist of all tinsel wire of the same type produced under essentially the same conditions, and offered for inspection at one time.

4.4.1.2 Sample unit. - A sample unit is a continuous length of ribbon or wire contained on a spool or reel.

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4.4.1.3 Rejected lots. - If an inspection lot is rejected, the supplier may rework it to correct the defects, or screen out the defective units, and resubmit for reinspection. Resubmitted lots shall be inspected using tightened inspection. Such lots shall be separate from new lots, and shall be clearly identified as reinspected lots.

4.4.1.4 Group A inspection. - Group A inspection shall consist of the examinations and tests specified in table VIII.

4.4.1.4.1 Sampling plan. - Statistical sampling and inspection for Group A shall be in accordance with MIL-STD-105 for general inspection level II. The acceptable quality level (AQL) shall be 4.0% defective. Major and minor defects shall be as defined in MIL-STD-105.

Table VIII. Group A inspection.

Examination or test	Requirement paragraph	Test Method paragraph
Visual and dimensional examinations	3.1.1, table II, 3.2.1, table IV, 3.2.2, table V, and 3.3	4.5.1 to 4.5.1.2

4.4.1.4.2 Sampleg. - Sample units for the ribbon shall be selected from lots containing flat ribbon prior to assembly into strands. Sample units for the wire shall be selected from lots containing finished wire. Failure in visual and dimensional examination shall constitute a defective sample unit.

4.4.1.5 Group B inspection. - Group B inspection shall consist of the examinations and tests specified in table IX, and shall be made on sample units which have been subjected to and have passed group A inspection.

4.4.1.5.1 Sampling plans. - The sampling plan shall be in accordance with MIL-STD-105 for special inspection level S-4. The AQL shall be 6.5 percent defective. For each test, two specimens shall be cut at least 10 feet apart for each of the number of sample units required. Determination of what constitutes a defective sample unit shall be made as specified in the applicable method. Should the same sample unit be defective in more than one test, it shall be counted as one defective sample unit.

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Table IX. Group B inspection.

Examination or test	Requirement paragraph	Test Method paragraph
Ribbon:		
Breaking load	table III	4.5.2
DC resistance	table III	4.5.3
Bending	table III	4.5.4
Wire:		
Breaking load	table VI	4.5.2
DC resistance	table VI	4.5.3
Conductivity of strand and core yarns	3.1.2.1	4.5.5

4.4.1.5.2 Disposition of sample units. - Sample units which have passed all the group B inspections may be delivered on the contract or purchase order, if the lot is accepted and the sample units are still within specified electrical tolerances.

4.5 Methods of examination and test.

4.5.1 Visual and dimensional examination. - Ribbon, strand, and wire shall be examined to verify that the dimensions, construction and workmanship are in accordance with the applicable requirements. (See 3.1.1, table II, 3.2.1, table IV, 3.2.2, table V, and 3.3.) The examinations and measurements shall be made on twenty-foot lengths of flat ribbon or wire from a portion of the ribbon or wire no closer than 10 feet from the outside end of the spooled wire. The diameter of wire shall be measured with a micrometer caliper.

4.5.1.1 Coating of ribbon. - When the ribbon is silver or tin coated (see 6.2), the same specimens selected for the dimensional measurements shall be carefully examined to assure that the coating is as specified in 3.1.1.

4.5.1.2 Dimensions of ribbon. - The dimensions of the ribbon shall be determined as the average of the measurements made on two separate specimens. If either dimension of a specimen falls outside the limits specified in table II, the sample unit shall be considered defective. The thickness shall be measured with a micrometer caliper, and the width shall be measured with a micrometer microscope or any other instrument accurate to 0.1 mil.

4.5.2 Breaking load. - The breaking load of the ribbon or wire shall be determined on two specimens cut from each sample unit. If either of these two values falls below the requirements specified in tables III and VI, the sample unit shall be considered defective. The tests shall be performed on ribbon or wire

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which has been carefully unwound and cut, from a spool or reel, in lengths long enough to clamp in the testing-machine jaws when set 10 inches apart. Ribbon thus removed shall be reasonably flat before being placed in the testing machine. The stress shall be applied at the rate of not more than 5 inches per minute. The testing machine shall be of such a capacity that the breaking load of a single ribbon or wire specimen can be measured to an accuracy of +2 percent. Fractures shall occur between the jaws and not closer than 1 inch to either one. Fractures which do not meet this requirement shall be disregarded. In such cases, additional specimens shall be tested from the same sample unit.

4.5.3 DC resistance. - Direct-current (dc) resistance of the ribbon or wire shall be determined as the average of the tests made on two specimens cut from each sample unit, using any standard method producing a resistance measurement to an accuracy of +1 percent. If the average thus determined falls outside the limits specified in tables III and VI, the sample unit shall be considered defective.

4.5.4 Bending. - The number of bends the ribbon withstands shall be determined as the average of the tests made on two specimens of suitable length cut from each sample unit. If the average falls below the requirement specified in table III, the sample unit shall be considered defective. One end of the specimen shall be wrapped, at least three times, around a 0.04-inch-diameter pin or its supporting shaft, while the other end shall have a 1 3/4-ounce weight attached and shall be allowed to hang free. The ribbon shall be flat on the pin, and the edges of the successive turns shall not touch nor overlap. The pin, with its turns of ribbon, shall be rotated on its long axis 90° in one direction, and then 90° in the opposite direction, continuously, resulting in the ribbon being alternately wrapped and unwrapped one-fourth turn around the pin. One wrap and one unwrap shall together constitute a bend. The test shall be performed at the rate of 300 bends per minute.

4.5.5 Conductivity of strand and core yarns. - The strand and core yarn shall be subjected to the following test: One-half gram of material removed from the finished (but unshielded) wire shall be boiled for 10 minutes in 60 to 70 cubic centimeters of distilled water which has a conductivity of not more than 5 micromhos per centimeter cube at 20°C. Enough distilled water shall then be added to make a volume of 100 cubic centimeters. The conductivity of this solution shall be measured with alternating current, and shall be determined as the average of two specimens removed from each sample unit. If the average thus determined exceeds the requirement specified in 3.1.2.1, the sample unit shall be considered defective. A conductivity cell may be used for this test.

5. PREPARATION FOR DELIVERY

5.1 Not applicable to this specification.

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6. NOTES

6.1 Intended use. - The uninsulated tinsel electrical wires described in this specification are intended for use where extreme flexibility is required, such as in tinsel electrical cord for telephones, switchboards, microphones, and similar equipment.

6.2 Ordering data. - Procurement documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Type of wire required. (See 1.2.)
- (c) Whether coated ribbon is required. (See 3.1.1.)

6.3 Corrosion. Where corrosion to the wire by rubber chemicals in the wire insulation (or migration from the jacket through the insulation) will occur, tin-coated ribbon should be used where it is not feasible to adjust the rubber compound.

Custodians:

Army - EL
Air Force - 17

Review Activities:

Air Force - 80, 85
NSA
DSA - IS

User Activities:

Army - AV, MI, ME, MU
Navy - OS, SH

Preparing Activity:

Army - EL

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