

INCH-POUND

MIL-W-22759E
AMENDMENT 2
16 October 1998
SUPERSEDING
MIL-W-22759E
AMENDMENT 1
07 May 1991

MILITARY SPECIFICATION

WIRE, ELECTRICAL, FLUOROPOLYMER - INSULATED COPPER OR COPPER ALLOY

This amendment forms a part of MIL-W-22759E, dated 07 May 1991, and is approved for use by all Departments and Agencies of the Department of Defense.

PAGE 1

- * 1.1, second sentence: Delete "TFE" and substitute "PTFE."

PAGE 2

- * 2.1.1: Delete "MIL-STD-105 Sampling Procedures and Tables for Inspection by Attributes," "MIL-STD-109 Quality Assurance Terms and Definitions," "MIL-STD-45662 Calibration Systems Requirements." Add "MIL-W-29606 Wire, Electrical, Stranded, Uninsulated Copper, Copper Alloy, or Aluminum, or Thermocouple Extension, General Specification For," "MIL-T-83133 "Turbine Fuel, Aviation, Kerosene Types, NATO F-34 (JP-8) and NATO F-35," "MIL-STD-2223 Test Methods for Insulated Electric Wire."

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- * 2.2: Add the following:

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI-Z540.1 - Laboratories, Calibration and Measuring and Test
Equipment. (DoD adopted)

(Application for copies should be addressed to the American National Standards Institute,
11 West 42nd Street, New York, NY 10036).

AMERICAN SOCIETY FOR QUALITY CONTROL (ASQC)

ASQC-Z1.4 - Sampling Procedures and Tables for Inspection by Attributes.
(DoD adopted)

(Application for copies should be addressed to the American Society for Quality Control,
P.O. Box 3005, 611 Wisconsin Avenue, Milwaukee, WI 53201-4606.)

PAGE 4

3.4.1, add the following after the second sentence: "All conductor used shall meet the
requirements of MIL-W-29606."

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- * 3.4.2.1.1, paragraph title, first, second, and third sentences: Delete "TFE" and substitute
"PTFE."

- * 3.4.2.2, paragraph title: Delete "TFE" and substitute "PTFE."

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- * Table I: Delete "TFE" and substitute "PTFE", in three places, and add "(FEP)" after
"Fluorinated Ethylene Propylene."

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- * 3.5.1.3.1, end of paragraph: Delete “4.6.3.7.1” and substitute “4.6.3.8.1.”
- * 3.5.1.4, end of first sentence: Add “and conductors shall meet the minimum circular mil area (CMA) as specified in MIL-W-29606.”
- * 3.5.3, delete and substitute:

3.5.3 Insulation flaws test of primary insulation. When required by the applicable specification sheet, one hundred percent of the wire, following application of the primary insulation, shall be subjected to the spark test of 4.6.2.4.1, or the impulse dielectric test of 4.6.2.4.2, or the high frequency spark test of 4.6.2.4.3. This evaluation shall be performed before the application of any materials to the wire.

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- * Table III, Impulse dielectric test: Delete and substitute “Insulation flaws test” and substitute “3.6.2” under requirements and “4.6.3.1” under method. Acid resistance test: Delete. At the end of table add “Crosslink proof” under examination or test, “Spec sheet 1” under requirements, and “4.6.3.15.” under method.

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- * 3.6.1, end of paragraph: Add “The concentricity requirement shall not apply to tape-wrap constructions.”
- * 3.6.2, delete and substitute:

3.6.2 Insulation flaws test. One hundred percent of the finished wire shall pass either the impulse dielectric test of 4.6.3.1.1, or the high frequency spark test of 4.6.3.1.2. This test shall be performed during the final winding of the wire on shipment spools or reels.

3.6.5, end of line 5, add the following sentence: “The printed identification shall consist of the following, at intervals of 6 inches to 60 inches, as measured from the end of one complete marking to the beginning of the succeeding complete marking.”

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- * 4.3.1, end of paragraph: Delete “MIL-STD-45662” and substitute “ANSI-Z540.1.”

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* Table VI, Group I, add: “Circumferential elongation” under examination or test, “Table I” under requirements, and “4.6.2.3” under method. Group II, add “Crosslink proof” under examination or test, “spec sheet 1” under requirements, and “4.6.3.15” under method. Group II, delete first reference to Conductor strand adhesion test. Group III, Impulse dielectric test, delete and substitute: “Insulation flaws test” and substitute “3.6.2” under requirements and “4.6.3.1” under method.

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* Table VII, acid resistance test: Delete “Acid resistance (when required in the specification sheet)” requirement. At the end of the table: Add “propellant resistance (when specified in the specification sheet)” under examination or test, “Spec sheet 1” under requirements, and “Spec sheet 1” under method.

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* Table VIII, Insulating material test: In method paragraph, delete “4.5.1.1.2” and substitute “4.6.2.2, 4.6.2.3, 4.6.2.5”. Spark test of primary insulation, delete and substitute: Insulation flaws test of primary insulation (when specified in the applicable specification sheet)” and substitute “3.5.3” under requirements and “4.6.2.4” under method. Circumferential elongation test, test method paragraph: Delete “4.6.2.3.2” and substitute “4.6.2.3.”

* 4.5.1.1.4, delete and substitute:

4.5.1.1.4 Insulation flaws test of primary insulation. When a test for flaws of the primary insulation is required (see 3.5.3) test 100 percent of the wire after application of the insulation and prior to the application of any other material. Portions showing dielectric breakdown under test shall be cut out or removed and testing of the balance of production shall be resumed.

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* 4.5.1.1.5, add as new paragraph:

4.5.1.1.5 Circumferential Elongation. When polytetrafluoroethylene (PTFE) or abrasion resistant (mineral filled) PTFE is used, five samples representative of each inspection lot shall be selected after extrusion. Circumferential elongation testing is not required for other insulation types.

* 4.5.2.1.4, end of second sentence: Delete “MIL-STD-105” and substitute “ASQC-Z1.4.”

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- * 4.5.2.1.5, delete and substitute:

4.5.2.1.5 Sampling and acceptance for the Group III Insulation flaws test. One hundred percent of the finished wire, and every length of the wire shall be subjected fully to the test for insulation flaws. Insulation breakdowns resulting from the test, and ends or portions not subjected to the test shall be marked or cut out of the finished wire. When specified in the contract or order, dielectric failure, untested portions, or portions which have been exposed to fewer or more than the specified number of pulses or cycles are permitted to be marked by stripping the insulation or any other method specified in the contract in lieu of being cut out the wire.

- * 4.5.3, end of second sentence: Delete “MIL-STD-105” and substitute “ASQC-Z1.4.”

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- * 4.6.2.2.2.4: Delete “TFE” from paragraph title and fourth line and substitute “PTFE.”

- * 4.6.2.3, delete and substitute:

4.6.2.3 Circumferential elongation (extruded PTFE or abrasion resistant PTFE insulation only). This test method measures the elongation of a thin slug of wire insulation in the circumferential (radial) direction. The wire insulation slug is radially elongated by axial movement of a tapered cone through the stationary slug. The test apparatus is shown in figures 1, 2, and 3. A 1 to 1½ inch slug of insulation shall be removed from the conductor. Care shall be taken to prevent scratching, crimping, stretching, or otherwise damaging the insulation. The diameter of the exposed conductor should be measured to the nearest 0.001 inch. Cut five test specimens 0.125 ^{+/-} .02 inch in length from the insulation slug using a sharp razor blade or other sample preparation fixture. Both ends of the test specimens shall be cut square. Attach the cone to the moveable crosshead. Slide a test specimen onto the cone until it just touches the surface of the cone. Position the specimen holding block perpendicular to the cone as shown in figure 1. Align the cone tip and the appropriate sized hole of the specimen holding block for the wire size being tested. Move the cone through the stationary specimen at a uniform speed of 20 ^{+/-} 0.2 inches/minute until the specimen ruptures. Determine the total distance the slug has traveled along the cone from the point of initial contact with the cone to the point of rupture. The percent elongation (%CE) is calculated as follows:

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$$\%CE = \left(\frac{2 \times L \times \tan \theta}{CD} \right) \times 100\%$$

L= Total distance slug has traveled from initial contact with the cone to the point of rupture.

CD= Conductor diameter (inches)

θ = Measured cone angle taper (degrees)

Five specimens shall be tested and the average value of the specimens calculated.

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* 4.6.2.4, delete and substitute the following new paragraphs:

4.6.2.4 Insulation flaws test of primary insulation (when specified, 3.5.3). One of the following methods shall be used to determine the presence of faulty areas on the primary insulation. One hundred percent of the wire shall be tested, and any portion showing insulation breakdown shall be cut out of the wire on each side of the failure.

4.6.2.4.1 Spark test of primary insulation. The wire, after the application of the primary insulation and prior to the application of any other material, shall be passed through a chain electrode spark test device using the voltage and frequency specified in the applicable specification sheet. The electrode shall be of a bead chain or fine mesh construction that will give intimate metallic contact with most of the insulation surface. Electrode length and speed of wire movement shall be such that the insulation is subjected to the test voltage for a minimum of 0.2 second.

4.6.2.4.2 Impulse dielectric test of primary insulation. Perform in accordance with 4.6.3.1.1. Unless otherwise specified on the specification sheets, perform the impulse dielectric test at 6.0 kV (peak).

4.6.2.4.3 High frequency spark test of primary insulation. Perform in accordance with 4.6.3.1.2. Unless otherwise specified in the specification sheets, perform the high frequency spark test at 4.2 kV (rms).

* 4.6.3.1, 4.6.3.1.1, 4.6.3.1.2, and 4.6.3.1.3, delete and substitute:

4.6.3.1 Insulation flaws test. One of the following methods shall be used to determine the presence of faulty areas on the insulation of the finished wire. One hundred percent of the finished wire shall be tested, and any portion showing insulation breakdown shall be cut out of the wire including at least 2 inches of wire on each side of the failure.

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4.6.3.1.1 Impulse dielectric test. Wire with primary insulation and finished wire shall be tested in accordance with MIL-STD-2223, Method 3002 at the voltage specified in the applicable specification sheet. Unless otherwise specified in the specification sheets, perform the impulse dielectric test at 8.0 kV (peak) for finished wire.

4.6.3.1.2 High frequency spark test. As an alternative to the impulse dielectric test, the 3 KHz high frequency spark test in accordance with MIL-STD-2223, Method 3008 is permitted for the detection of flaws in primary insulation and finished wire, unless otherwise specified in the specification sheets, perform the high frequency spark test at 5.7 kV (rms) for finished wire.

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* 4.6.3.9, end of first sentence: Delete “4.6.3.8.1” and substitute “4.6.3.9.1”, and delete “4.6.3.8.2” and substitute “4.6.3.9.2.”

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* 4.6.3.11.3, third test fluid: Delete “.75%” and substitute “75%.”

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* 4.6.3.15, delete and substitute:

4.6.3.15 Life cycle. The following test method covers life cycle and crosslink proof tests. For crosslink proof testing, use the temperature and times for the requirement as listed in the applicable specification sheet.

* 4.6.3.15.1, next to last sentence: Delete “4.6.3.14.2” and substitute “4.6.3.15.2” and delete “4.6.3.14.3” and substitute “4.6.3.15.3.” Also, at the end of the paragraph add “(See 6.1.3).”

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* Figure 4: Move figure 4 to page 34 and renumber page 34 as page 35.

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* 4.6.3.16, subparagraph d: Delete and substitute Turbine fuel, aviation, Grade JP-4, MIL-T-5624 or turbine fuel, aviation, kerosene type, JP-8, MIL-T-83133.

* 4.6.3.17.2, first sentence: Delete “4.6.3.16.1” and substitute “4.6.3.17.1.”

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* 5.1, 5.1.1, 5.1.1.1, 5.1.1.2, 5.1.2, 5.2, and 5.3: Delete and substitute:

* 5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of material is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

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* Add as new paragraph:

6.1.3 Pitting. Pitting is defined as small holes or cavities in the conductor surface that are large enough to be seen with the unaided eye. Discoloration (such as the formation of intermetallic compounds) or surface changes caused by the flow of tin are not considered pitting.

Changes from previous issue. The margins of this specification are marked with asterisks to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

CONCLUDING MATERIAL

Custodians:

Army - CR

Navy - AS

Air Force - 85

NASA - NA

Preparing activity:

Navy - AS

(Project 6145-2172)

Review Activities:

Army - AR, AT, AV, ME, MI

Navy - EC, MC, OS

Air Force - 11, 80