INCH-POUND

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SUPERSEDING
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DETAIL SPECIFICATION

CABLE, SPECIAL PURPOSE, ELECTRICAL WM-46/U

Inactive for new design after 16 June 1997

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

1. SCOPE

1.1 Scope. This specification covers one type of ten conductors, Buna S insulated and jacketed cable designated as Cable, Special Purpose, Electrical WM-46/U. Eight of the conductors are equivalent to 20 AWG, four of which are shielded, and two of the conductors are equivalent to 16 AWG, one of which is shielded.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation (see 6.2).

AMSC N/A FSC 6145

SPECIFICATIONS

FEDERAL

A-A-59551	-	Wire, Electrical, Copper (Uninsulated).

DEPARTMENT OF DEFENSE

MIL-I-631	-	Insulation, Electrical, Synthetic–Resin Composition, Non-rigid.
MIL-I-3930	-	Insulating and Jacketing Compounds, Electrical (For Cables, Cords, and Wires).

STANDARDS

FEDERAL

FED-STD-228	-	Cable and Wire, Insulated; Methods of Testing.

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following document forms a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DoDISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z540.1	-	Calibration Laboratories and Measuring Test Equipment–General Requirements.

(Application for copies should be addressed to the American National Standards Institute, 25 West 43rd Street, 4th Floor, New York, New York, 20036.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.2 Materials. The materials used for Cable, Special Purposes, Electrical WM-46/U shall be as specified herein.

3.3 Conductors. Cable, Special Purposes, Electrical WM-46/U shall consist of eight 20 AWG conductors and two 16 AWG conductors conforming to A-A-59551 for coated type B, class K wire for ordinary flexing service.

3.4 Conductor separator. A close wind of fine cotton or rayon shall be applied over each conductor. This separator may be omitted if a free stripping insulating compound is used.

3.5 Insulation.

3.5.1 Physical properties. Each conductor shall be insulated with differently colored insulating compounds or the same color compound depending on the method of color coding (see 3.6). The physical properties of the insulation from each conductor shall conform individually to the requirements for either type IS-L or type IL compound as specified in MIL-I-3930 except that brittleness temperature, torsional stiffness ratio, and cold-tension recovery requirements shall not apply.

3.5.2 Insulation thickness. The insulation thickness shall be not less than 0.020 inch, or if followed by a braid or serving over the insulation, the thickness shall not be less than 0.015 inch.

3.6 Insulation color coding. Each insulated conductor shall be differently color coded with colored insulating compounds or a color coded braid. The following colors shall be used on the conductors tabulated below:

Conductor AWG	Color
20	Black
20	White
20	Red
20	Green
16	Orange
16	Blue
20	Brown
20	Yellow
20	Slate
20	Purple

3.7 Shielded conductors. Five of the insulated conductors, colored blue, brown, yellow, slate and purple, shall each have an individual braid of tinned soft or annealed copper wire applied over the insulation or textile braid if used to a minimum coverage of 85 percent. Each strand of the braid shall consist of 34 AWG wire in accordance with A-A-59551 for coated type S, soft or drawn-and-annealed wire prior to braiding.

3.8 Cabling. The black and the white conductors shall be twisted together with a lay not exceeding 2 inches. The remaining conductors shall be cabled around the central conductors with a lay not exceeding 7 inches. The outer conductors shall be placed in the same order around the cable as the order of the colors of insulation tabulated in 3.6.

3.9 Overall shield. A close braid of tinned, soft, or annealed copper wire shall be applied over the cable conductors to a minimum coverage of 85 percent. Each strand of the braid shall consist of 34 AWG wire in accordance with A-A-59551 for coated type S, soft or drawn-and-annealed wire prior to braiding.

3.10 Jacket separator. A close wind of fine cotton or rayon shall be applied over the shield.

3.11 Jacket. The jacket shall be type JS-L in accordance with MIL-I-3930, except that tear resistance, brittleness temperature, torsional stiffness ratio, and cold tension recovery requirement shall not apply. The jacket shall be applied over the separator to an outside diameter of 0.615 plus or minus 0.015. The wall thickness of the jacket shall be not less than 0.030 inch. The outer jacket shall be uniformly smooth and shall have no ridges, pits, depressions, embossed or engraved markings, or any other irregularities which would impair the smoothness of the jacket.

3.12 DC resistance. When tested as specified in 4.5.7, each conductor shall have a DC resistance corresponding to its size at, or corrected to, 25°C, as follows:

Conductor size (AWG)	DC resistance, maximum ohms per 1,000 feet
20	12.1
16	4.7

3.13 Dielectric strength. The insulated conductor shall withstand for 1 minute without breakdown an alternating current potential of 1,000 volts root-mean-square (rms.), when tested as specified in 4.5.8.

3.14 Insulation resistance. Immediately after the insulated conductors have withstood the dielectric strength test, the insulation resistance shall be measured as specified in 4.5.9. The insulation resistance of Buna S insulated conductors shall be not less than 500 megohms – 1000 feet when measured at or corrected to 15.6°C. The insulation resistance of latex insulated conductors shall be not less than 7,500 megohms – 1,000 feet when measured at or corrected to 15.6°C.

3.15 Cold bend. The insulation and the jacket shall not crack when tested as specified in 4.5.13 at a temperature of minus 40°C ± 2°C.

3.16 Marking of cable. The cable shall be marked on the outside with an inked marking and on the inside under the overall shield with a marker tape. All letters and numbers in the marking shall be of the same height.

3.16.1 Inked marking. Inked marking shall be clear and legible. The marking shall show no indication of cracking when bent as specified in 3.15. The inked marking shall consist of the designation WM-46/U, and the number of this specification with three to five letter spaces allowed between them. The marking shall be repeated at intervals along the cable not to exceed one foot.

3.16.2 Marker tape. The marker tape shall consist of a thin synthetic tape conforming to MIL-I-631 or flat woven tape of cotton or synthetic yarn. The designation of WM-46/U, the number of this specification, the year of manufacture, and the manufacturer's name or trademark, shall be permanently printed in succession on the tape. Serial number indicating footage may be supplied at the option of the manufacturer. Spacing between cable designation, number of specification, etc., shall be three letters in width. The marking shall be repeated at intervals along the tape not exceeding one foot. The tape shall be applied longitudinally.

3.17 Workmanship. All cables shall be manufactured and finished in a thoroughly workmanlike manner in accordance with 3.3 through 3.11, and 3.16 through 3.16.2, inclusive.

4. VERIFICATION

4.1 Test equipment and inspection facilities. Test and measuring equipment and inspection facilities of sufficient accuracy, quality, and quantity to permit performance of the required inspections shall be used. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with ANSI Z540.1 or equivalent.

4.2 Classification of inspections. The inspection requirements specified herein are classified as conformance inspection (see 4.4).

4.3 Inspection conditions. Unless otherwise specified in the applicable test method, inspections shall be conducted under the following environmental conditions.

a. Temperature: 15°C to 35°C.

b. Pressure: Normal atmospheric.

c. Humidity: Prevailing ambient (25 to 90 percent relative).

4.4 Conformance inspection. Conformance inspection shall consist of groups A and B inspections (see 4.4.5 and 4.4.6, respectively) specified in table I and shall be performed on every lot of cable procured under this specification. Sampling inspection shall be accomplished for each lot in accordance with 4.4.2.

TABLE I. Group A and B inspections.

Inspection	Requirement	Verification	Group A	Group B
Visual and mechanical	-	-	X	-
Color coding	3.6	4.5.1	X	-
Overall shielding	3.9	4.5.2	X	-
Conductor shield	3.7	4.5.3	X	-
Cabling	3.8	4.5.4	X	-
Conductor separator	3.4	4.5.5	X	-
Jacket separator	3.10	4.5.6	X	-
Electrical	-	-	X	-
DC resistance	3.12	4.5.7	X	-
Dielectric strength	3.13	4.5.8	X	-
Insulation resistance	3.14	4.5.9	X	-
Conductors	3.3	4.5.10	-	X
Insulation thickness	3.5.2	4.5.11	-	X
Jacket	3.11	4.5.12	-	X
Cold bend	3.15	4.5.13	-	X
Marking of cable	3.16	4.5.14	-	X

4.4.1 Lot. A lot shall consist of all cable manufactured under substantially the same conditions and offered for inspection at one time.

4.4.1.1 Lot size. The lot size shall be defined as the number of units of product submitted for inspection.

4.4.1.2 Unit of product. A unit of product shall be defined as the continuous length of cable contained on a single reel, spool, or in a coil.

4.4.1.3 Specimen. A specimen is a single piece of finished cable or any part removed from the finished cable such as conductors, separators, insulated conductors, shielded conductors, or cabled and shielded conductors, insulations, and jacket, which is taken from a sample unit and subjected to inspection.

4.4.2 Sampling. A random sample shall be selected from each lot in accordance with table II.

TABLE II. Inspection sample.

Inspection lot size 1/	Accept on zero sample size
1	1
2 to 8	2
9 to 90	3
91 to 150	12
151 to 280	19
281 to 500	21
501 to 1,200	27
1,201 to 3,200	36
3,201 to 10,000	38
10,001 to 35,000	46

1/ Lot size is based on the number of units of product

4.4.3 Rejected lot. Failure of any sample to pass any inspection shall constitute a failure of the lot. If an inspection lot is rejected, the contractor may rework the lot to correct the defects or screen out the defective units, and resubmit the lot for re-inspection. Such lots shall be separated from new lots and shall be identified as re-inspected lots (see 4.4.4).

4.4.4 Noncompliance. If a sample fails to pass any inspection, the contractor shall notify the cognizant inspection activity of such failure and take corrective action on the materials or processes or both, as warranted on all units of the product. Acceptance and shipment of the product shall be discontinued until corrective action has been taken. After the corrective action has been taken, the conformance inspection shall be repeated on replacement articles. (This includes all tests and examinations, or only the test that the original sample failed, at the option of the cognizant inspection activity.) Final acceptance and shipment shall be withheld until inspection has shown that the corrective action was successful. In the event of failure after re-inspection, information concerning the failure shall be provided to the cognizant inspection activity.

4.4.5 Group A inspection. Group A inspection shall include the applicable inspections specified in table I.

4.4.6 Group B inspection. Group B inspection shall include the applicable inspections specified in table I. Unless otherwise specified (see 6.2), group B inspection shall be performed on sample units that have been subjected to and have passed the group A inspection.

4.5 Methods of inspection.

4.5.1 Insulation color coding. Samples of the cable shall be examined for compliance with 3.6.

4.5.2 Overall shield. Samples of the shielded cable shall be examined for compliance with 3.9.

4.5.3 Shielded conductors. Samples of the insulated and shielded conductors shall be examined for compliance with 3.7.

4.5.4 Cabling. Sampling of the cabled conductors shall be examined for compliance with 3.8.

4.5.5 Conductor separator. Samples of each of the insulated conductors shall be examined for compliance with 3.4.

4.5.6 Jacket separator. Samples of the cable shall be examined for compliance with 3.10.

4.5.7 DC resistance. This test shall be performed in accordance with method 6021 of FED-STD-228 for compliance with 3.12.

4.5.8 Dielectric strength. This test shall be performed in accordance with method 6111 of FED-STD-228 for compliance with 3.13.

4.5.8.1 Alternate test procedure. The following alternate test procedure may be used in place of the test procedure specified above:

a. Arrange the 10 conductors and the shielding in a rectangle containing 3 rows and 4 columns. The last column will contain 2 unused spaces.
b. Connect all the conductors in a column together. Do this for each column.
c. Apply the specified test voltage, for the specified time, between each column of the rectangle in turn, and the remaining columns connected together.
d. Connect all the conductors in a row together. Do this for each row.
e. Apply the specified test voltage, for the specified time, between each row of the rectangle in turn, and the remaining rows connected together.
f. Connect all the conductors together.
g. Apply the specified voltage, for the specified time, between all the conductors connected together and to sheath.

Number of conductors	Number of rows	Number of columns	Number of unused spaces
10	3	4	2

4.5.9 Insulation resistance. This test shall be performed in accordance with method 6031 of FED-STD-228 for compliance with 3.14.

4.5.10 Conductors. Samples of the cable shall be examined for the number and size of conductors as specified in 3.3.

4.5.11 Insulation thickness. Insulation thickness shall be measured by any method in FED-STD-228 for compliance with 3.5.2.

4.5.12 Jacket. Samples of the cable shall be examined for compliance with 3.11.

4.5.13 Cold bend.

4.5.13.1 Specimens. One specimen from each sample unit shall be prepared for test. In the event of failure of any one specimen, two additional specimens shall be prepared.

4.5.13.2 Procedure. The specimens selected for checking cable as a whole shall be attached to a 2.38 inch mandrel. The specimens removed from the cable for checking the insulation apart from the cable shall consist of the insulated conductors with all the other coverings over the insulation removed. One of each differently color insulated conductor shall be attached to the proper size mandrel. The number 16 AWG insulated conductor shall be attached to a .094-inch mandrel and the number 20 AWG insulated conductor shall be attached to a .062-inch mandrel. The specimens shall be suspended vertically with lower ends weighted sufficiently to keep specimens taut and to prevent bending them without handling. The mandrel and specimens shall be placed for at least 20 hours in the cold chamber at a temperature of minus 40 plus or minus 2°. While at this temperature, the specimens shall be bent for five close turns around the mandrel at the rate of approximately 15 turns per minute. After the test has been completed, the jacket on the specimen of cable shall be examined through a magnifying glass of at least three-diameter magnification and then removed. The conductor insulation on all specimens shall be examined for cracks with magnifying glass for compliance with 3.15.

4.5.14 Marking of cable. Samples of the cable shall be examined for compliance with 3.16.

4.5.15 Insulating and jacketing compounds. The insulating and jacketing compounds shall be examined and tested as specified in MIL-I-3930.

4.5.16 Conductors and shield strands. The conductors and shield strands prior to fabrication of cable shall be examined and tested as specified in A-A-59551.

5. PACKAGING

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 materiel 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.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The cable covered by this specification is most commonly used as a power or audio frequency interconnecting cable between communication equipments at potentials up to 300 volts rms.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Title, number, and date of this specification.

b. Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1).

c. Packaging requirements (see 5.1).

d. Classification of cable required (see 1.1).

e. Length of cable required.

f. Group B inspection sample, if other than as specified (see 4.4.6).

g. Size of spool and length on each (see 5.1).

h. Coil, spool, and reel marking requirements.

6.3 Subject term (key word) listing.

Audio frequency
Buna-S insulation
Class K
Flexing

6.4 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue, due to the extent of the changes.

CONCLUDING MATERIAL

Custodians:
Army - CR
Navy - SH
Air Force - 11
DLA - CC

Review activity:
Army - MI

Preparing activity:
DLA - CC

(Project 6145-2330-000)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7, and send to preparing activity.
3 The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-DTL-2486D	2. DOCUMENT DATE *(YYYYMMDD)* 20030307

3. DOCUMENT TITLE
CABLE, SPECIAL PURPOSE, ELECTRICAL WM-46/U

4. NATURE OF CHANGE *(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)*

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME *(Last, First, Middle Initial)*	b. ORGANIZATION	
c. ADDRESS *(Include zip code)*	d. TELEPHONE *(Include Area Code)* (1) Commercial (2) DSN *(if applicable)*	7. DATE SUBMITTED *(YYYYMMDD)*

8. PREPARING ACTIVITY

a. NAME Defense Logistics Agency Defense Supply Center, Columbus	b. TELEPHONE *(Include Area Code)* (1) Commercial 614-692-0538 (2) DSN 850-0538
c. ADDRESS *(Include Zip Code)* DSCC-VAI P.O. Box 3990 Columbus, Ohio 43216-5000	**IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:** **Defense Standardization Program Office (DLSC-LM)** **8725 John J. Kingman Road, Suite 2533** **Fort Belvoir, Virginia 22060-6621** **Telephone 703 767-6888 DSN 427-6888**