INCH-POUND

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SUPERSEDING
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DETAIL SPECIFICATION

CABLE ASSEMBLIES AND CORD ASSEMBLIES, ELECTRICAL

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

1. SCOPE

1.1 Scope. This specification covers the minimum requirements, unless otherwise specified, for electrical cable and cord assemblies for use in communication equipment (referred to as cable assemblies (see 6.5.1)), except for radio frequency coaxial cable assemblies and fiber optic cable assemblies.

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 of 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 handbook. The following specifications, standards, and handbook form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

Comments, suggestions, or questions on this document should be addressed to Defense Logistics Agency Aviation VEB, 8000 Jefferson Davis Highway, Richmond, VA 23297-5616, or e-mailed to STDZNMGT@dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at https://assist.dla.mil/.

AMSC N/A FSC 5995

FEDERAL STANDARDS

FED-STD-228	- Test Methods for Cables and Wire, Insulated
FED-STD-601	- Rubber: Sampling and Testing

COMMERCIAL ITEM DESCRIPTION

A-A-59991	- Thread and Twine, Mildew Resistant or Water Repellent Treated

DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-DTL-15024	- Plates, Tags, and Bands for Identification of Equipment, General Specification for
MIL-M-24041	- Molding and Potting Compound, Chemically Cured, Polyurethane

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-202-106	- Method 106, Moisture Resistance
MIL-STD-202-107	- Method 107, Thermal Shock
MIL-STD-202-201	- Method 201, Vibration
MIL-STD-202-301	- Method 301, Dielectric Withstanding Voltage
MIL-STD-202-302	- Method 302, Insulation Resistance
MIL-STD-252	- Classification of Visual and Mechanical Defects for Equipment, Electronic, Wired, and Other Devices
MIL-STD-13231	- Marking of Electronic Items

DEPARTMENT OF DEFENSE HANDBOOK

MIL-HDBK-454	- General Guidelines for Electronic Equipment

(Copies of these documents are available online at https://quicksearch.dla.mil/.)

2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

AMERICAN SOCIETY FOR QUALITY (ASQ)

ASQ Z1.4	- Sampling Procedures and Tables for Inspection by Attributes

(Copies of this document are available online at https://asq.org/.)

SAE INTERNATIONAL

SAE AS5942	- Marking of Electrical Insulating Materials
SAE AS23053/5	- Insulation Sleeving, Electrical, Heat Shrinkable, Polyolefin, Flexible, Crosslinked

(Copies of these documents are available online at https://www.sae.org/.)

UNIFIED ABRASIVES MANUFACTURERS' ASSOCIATION (UAMA)

UAMA B74.18	- Grading of Certain Abrasive Grain on Coated Abrasive Products

(Copies of these documents are available online at https://uama.org/.)

2.4 Order of precedence. Unless otherwise noted herein or in the contract, 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 Detail requirements. The individual cable assemblies shall comply with all the requirements specified herein as well as those cited on the applicable detail specification, specification sheet, or drawing (see 6.2). In the event of a conflict between the requirements of this specification and other requirements of the applicable device specification, the precedence in which requirements shall govern, in descending order, is as follows:

a. Applicable device specification (detail specification or drawing).
b. This specification.
c. Specifications, standards, and other documents referenced in section 2.

3.2 First article. When specified (see 6.2), a sample shall be subjected to first article inspection in accordance with 4.2. First article inspection shall consist of all tests specified herein, and shall include materials inspection (see 4.2.1). Tests for insulation resistance and dielectric-withstanding voltage shall be performed manually and the insulation resistance readings shall be recorded (see 4.4.2 and 4.4.3).

3.3 Material. The material shall be specified in the applicable specification or drawing. However, when a definite material is not specified, a material shall be used which will enable the cable assembly to meet the performance requirements of this specification and shall be submitted to the contracting officer for approval. Acceptance or approval of any constituent material shall not be construed as a guarantee of the acceptance of the finished product (see 4.2.1).

3.3.1 Polyurethane. Molded polyurethane shall conform to MIL-M-24041 or shall meet material reversion test requirements (see 3.9.11).

3.3.2 Solders. MIL-HDBK-454, guideline 5, provides guidance on soldering of electrical connections (see 3.8.2).

3.4 Marking. Marking shall conform to MIL-STD-13231. Size of the characters and properties of the marking shall be as specified in SAE AS5942. Unless otherwise specified (see 3.1), the marking shall be on yellow heat-shrinkable tubing, type K2 per MIL-DTL-15024 or class 1 per SAE AS23053/5. All cable assemblies shall have markers applied as specified by the applicable drawings, contract, or order. The information to be marked on the cable band shall be as follows:

Line 1. Type designation and length, if part of the nomenclature. The length shall be in parentheses.
Line 2. Procurement instrument identification number (contract number).
Line 3 (if space permits). Manufacturer CAGE.
Line 4 (if space permits). National stock number.

3.5 Connectors. Connectors shall meet the requirements of the individual connector specification listed on the drawing or in the contract (see 6.2).

3.6 Design and construction.

3.6.1 Treatment of textiles. Staycords, fillers, binders, braids, and other textiles used in the construction of cable assemblies shall be treated in accordance with A-A-59991, using type I, class 1 mildew-inhibiting agent, with the following requirements waived:

a. Acidity (pH).
b. Color.
c. Breaking strength.

The treatment shall be applied only with an alcoholic solution. The methods of treatment shall be as specified in 3.6.1.1 or 3.6.1.2, as applicable. Treatment is not required for nylon, cellulose acetate, rayon acrylic fibers, polyester, and ends of cable assemblies that terminate in a potted or molded connector (see 6.5.3 and 6.5.4), or a molded crotch.

3.6.1.1 Cut lengths. Prior to attachment of any terminations, such as terminals and connectors, the cut lengths of the cable or cord, prepared for terminations, shall be immersed in the specified mildew-inhibiting solution as shown in table I.

TABLE I. Cable or cord mildew inhibition.

Outer covering of cable or cord	Degree of immersion
Textile, or textile covered by shielding	Complete length, uncoiled
Jacket of natural or synthetic rubber or of plastic	Three inches beyond the edge at which the textile is exposed

Immersion shall be for the minimum period of time necessary to obtain complete saturation, but shall not exceed five minutes. As soon as practical after immersion, the treated cable or cord shall be dried so that it may be free of residual solvent.

3.6.1.2 Pretreatment. Textiles may be treated prior to fabrication into cable or cord, provided that the textile is not subsequently covered by insulation or a jacket of natural or synthetic rubber, or plastic, which is applied with the use of heat.

3.6.2 Length of cable assembly. The length of the required cable assembly shall be as specified in the applicable drawing, specification, or contract (see 6.2). The length of the cable assembly as specified should be sufficient to allow for field repairs at each connector or stub end if intended use and storage conditions permit.

3.6.2.1 Cable assembly length tolerance. The tolerance of the overall length of the cable assembly shall be in accordance with table II. Other desired or critical tolerances for specific applications shall be as noted on the applicable drawing, specification, or contract (see 6.2).

TABLE II. Cable assembly length tolerances.

Range of minimum cable lengths [1, 2]	Standard tolerance
Less than 12	+0.25
12 to 23.875	+1.0
24 to 35.875	+1.5
36 to 53.875	+2.0
54 to 71.875	+2.5
72 to 150	+3.0
Greater than 150	+2 percent

[1] The length of a cable assembly is defined as the overall length, including terminations.
[2] Unless otherwise specified, all values are in inches.

3.7 Electrical requirements.

3.7.1 Continuity. Each circuit shall be continuous within the assembly, when tested as specified in 4.4.1.

3.7.2 Insulation resistance. The insulation resistance of the cable assembly shall be a minimum of 100 megohms when tested as specified in 4.4.2, except the insulation resistance of a shielded conductor shall be a minimum of 30 megohms.

3.7.3 Dielectric withstanding voltage. There shall be no evidence of voltage breakdown when tested as specified in 4.4.3.

3.7.4 Contact resistance variation (applicable only to assemblies using tinsel conductors). The contact resistance variation of each terminal and the tinsel conductor shall not exceed 0.06 ohm when tested as specified in 4.4.4.

3.8 Mechanical requirements.

3.8.1 Interchangeability. Connectors shall be tested as specified in 4.5.1. Like units, assemblies, and subassemblies shall be physically and functionally interchangeable, without modification. Individual items shall not be handpicked for fit.

3.8.2 Soldering. MIL-HDBK-454, guideline 5, provides guidance on soldering of electrical connections. All soldered electrical connections shall be tested in accordance with 4.5.2.

3.8.3 Pull. After being subjected to the test specified in paragraph 4.5.3, the cable assembly shall show no straining of individual conductors (when visible without major disassembly) or physical damage, and shall meet the requirements of 3.7.1, 3.7.2, 3.7.3, and 3.8.5. The pull shall be applied gradually to the required force and held at that force for 30 seconds.

3.8.4 Pull on connector components. Terminals and taper pins shall not pull off of the conductor ends or out of connectors when subjected to the test specified in 4.5.4.

3.8.5 Immersion (cable assemblies with watertight connectors and splices covered with molded rubber or shrinkable tubing). Cable assemblies shall be subjected to the test specified in 4.5.5. There shall be no evidence of moisture penetration into the connector, splice, or molded sections. The tested cable assemblies shall meet the requirements of insulation resistance (see 3.7.2).

3.8.6 Durability. Connectors that must be assembled to given dimensions, and that must be potted or molded in accordance with the information contained on the cable assembly drawing, shall be subjected to the durability test specified in 4.5.6. Following the test, and while still mated, the connectors shall meet the electrical requirements of 3.7. In addition, there shall be no physical damage, and the force required to unmate the connectors shall be within 10 percent of that measured prior to performing the durability test (see 6.6).

3.9 Service conditions.

3.9.1 Grind test (cables assemblies with molded or potted components only). After grinding as specified in 4.6.1, molded and potted components of the cable assembly shall show no voids or pits when viewed with 3X magnification.

3.9.2 Low temperature flex-life (cable assemblies with added transition). Each portion of a cable assembly containing a splice, crotch, or cable to jacket transition, shall be tested as specified in 4.6.2. Upon examination after test, there shall be no visible cracks, separation of the

bond, or other damage in the molded section or adjacent portion of the cable jacket. Following the test, the cable assembly shall meet the requirements of 3.7.1, 3.7.2, and 3.7.3.

3.9.3 Thermal shock. After being subjected to the test specified in 4.6.3, the assembly shall not exhibit any physical damage. Following the test, the cable assembly shall meet the requirements of 3.7.1, 3.7.2, and 3.7.3.

3.9.4 Moisture resistance (cable assemblies with watertight connectors). After testing as specified in 4.6.4, there shall be no visual evidence of blistering, corrosion, or exposure of the base metal of the connector, degradation of elastomers or separation of bonded materials. Following the test, the cable assemblies shall meet the requirements of 3.7.2.

3.9.5 Conductor insulation overcure (molded or heat-cured potted cable assemblies only). The same assembly that has met the requirements of 3.9.3 shall be tested as specified in 4.6.5. The insulation of each conductor within any portion of the cable jacket encased by a molded crotch, molded termination, or molded section shall be tested for overcure. The percent elongation shall be not less than 90 percent of the minimum unaged elongation requirement of the appropriate Government-approved material specification as tested in accordance with method 3031.1 of FED-STD-228.

3.9.6 Bend relief flexibility (flexible molded cable assemblies with bend reliefs only). The cable assembly shall be subjected to the test specified in 4.6.6. There shall be no bond separation or cracking between the bend relief and the cable jacket, connector housing, or back shell. The assemblies shall meet the requirements of 3.7.1, 3.7.2, and 3.7.3 (see 6.5.2).

3.9.7 Vibration. The cable assembly shall be tested as specified in 4.6.7. There shall be no evidence of bond separation at the cable jacket or connector, nor loosening of component parts or other mechanical fastening device from the mating receptacle. Following the test, the cable assembly shall meet the requirements of 3.7.1, 3.7.2, and 3.7.3.

3.9.8 Ozone resistance (molded rubber only). Cable assemblies with molded rubber shall be tested for ozone resistance as specified in 4.6.8. At the completion of the exposure period, there shall be no evidence of cracking in the bend relief or cable jacket when examined under 7X magnification.

3.9.9 Cable re-verification. The test shall be performed on cable manufactured 12 months prior to the date of shipment of the cable assembly to the government, and the test specimen shall meet the unaged elongation requirements listed in the applicable Government-approved material specification selected by the manufacturer. The cable shall be tested in accordance with 4.6.9, except that benchmarks shall be 2 inches apart, flat, and smooth steel grips of the self-aligning type may be used. The elongation after aging shall be based on the benchmarks applied before aging.

3.9.10 Durometer hardness. The durometer hardness Shore "A" of a molded termination and other molded sections shall be measured as specified in 4.6.10 and shall be not less than 50 Shore "A" durometer or as specified on the drawing or in the contract (see 6.2).

3.9.11 Reversion (polyurethane and polyacrylic compounds only). Polyurethane and polyacrylic molding, potting, insulating, or jacketing compounds used on cable assemblies shall be subjected to the test specified in 4.6.11 and as a result of the test the material shall not crack, run, drip, or deform, and the hardness after conditioning shall be no more than 10 points below the durometer hardness Shore "A" measured in 4.6.10. Except that for polyurethane compounds cured with non-carcinogenic agents, the change shall be no more than 15 points.

3.10 Workmanship. Cable assemblies shall be manufactured in such a manner as to be uniform in quality and shall be free from defects that will affect life or serviceability when tested as specified in 4.7.

3.11 Recycled, recovered, environmentally preferable, or biobased materials. Recycled, recovered, environmentally preferable, or biobased 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.

4. VERIFICATION

4.1 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. First article inspection (see 4.2).
b. Conformance inspection (see 4.3).

4.2 First article inspection. First article inspection, when specified, shall be performed by the contractor, after award of contract, and prior to production, at a location acceptable to the government (see 6.3). First article inspection shall be performed on sample units that have been produced with equipment and procedures to be used in production (see 3.2).

4.2.1 Materials inspection. Material inspection shall consist of the tests in table III and any other tests required. Other material inspections not in table III shall consist of test data certification by the contractor that the materials meet the drawings and other procurement documents for the cable assembly, as applicable (see 6.2).

TABLE III. Material inspection requirements.

Test requirement	Requirement paragraph	Test method paragraph
Cable re-verification	3.9.9	4.6.9
Durometer hardness	3.9.10	4.6.10
Material reversion	3.9.11	4.6.11

4.2.1.1 Sampling.

4.2.1.1.1 Cable re-verification. A specimen shall be selected from every length of bulk cable to be used in the manufacture of the assemblies, except for pre-cut cable lengths which shall have specimens selected on a sampling basis with an acceptance quality limit (AQL) as specified in the contract (see 6.2).

4.2.1.1.2 Other tests. Unless otherwise specified, the AQL for all other material inspections shall be as specified in the contract (see 6.2).

4.2.2 Sample size. Fifteen sample units shall be submitted for first article inspection, unless an alternate quantity is specified in the contract or order (see 6.2).

4.2.3 Testing routine. All of the first article samples shall be subjected to groups A and B inspection. In addition, samples shall be taken for testing as shown in table IV.

TABLE IV. First article inspection requirements.

Test requirement	Requirement paragraph	Test paragraph	Number of test samples
Moisture resistance	3.9.4	4.6.4	2
Ozone resistance	3.9.8	4.6.8	2
Grind	3.9.1	4.6.1	1 [1]
Conductor insulation overcure	3.9.5	4.6.5	
Thermal shock	3.9.3	4.6.3	4 [2]
Low temperature flex-life	3.9.2	4.6.2	
Vibration	3.9.7	4.6.7	
Bend relief flexibility	3.9.6	4.6.6	
Durability	3.8.6	4.5.6	

[1] Grind and conductor insulation overcure tests to be performed on the same sample.
[2] Thermal shock, low temperature flex-life, vibration, bend relief flexibility, and durability tests to be performed on the same four samples in the sequence shown.

All samples shall be selected at random for each test. The balance of untested samples shall be held in reserve and may be substituted for samples that fail. The substituted sample must be subjected to all of the tests where more than one test is being performed. Reason for the substitution must be fully documented and explained in the test report. The cause for failure and subsequent meeting of requirements will be considered as part of the overall review of the test report and its acceptance or rejection (see 6.3).

4.2.4 Preconditioning. The contractor shall be permitted to precondition the cable assemblies prior to performing any electrical tests. The preconditioning shall consist of removing surface moisture from the assemblies by wiping, drying, or blowing. As an alternate, a 24-hour waiting period in an ambient room temperature is permitted.

4.3 Conformance inspection.

4.3.1 Inspection of product for delivery. Inspection of product for delivery shall consist of group A, B, and C inspections except as otherwise indicated.

4.3.1.1 Inspection lot. An inspection lot shall consist of cable assemblies covered by the drawing or procurement document employing the same type and size of connector, the same type and size of cable, and the same materials and methods of assembly, produced under essentially the same conditions, and offered for inspection at one time.

4.3.1.2 Unit of product. The unit of product, for purposes of sampling, shall be each cable assembly as specified in the contract or order (see 6.2).

4.3.1.3 Sample. The sample consists of one or more units of product drawn from a lot, the units of the sample being selected at random without regard to their quality. The number of units of product in the sample is the sample size.

4.3.1.4 Specimen. A specimen may be one unit of product or any portion of the unit of product that is to be subjected to inspection.

4.3.1.5 Rejected lots. If an inspection lot is rejected after group A or group B inspection, the contractor may withdraw the lot, rework it to correct the defects, or screen out the defective units, as applicable, and reinspect. Such lots shall be separate from new lots, and shall be clearly identified as reinspected lots. Resubmitted lots shall be inspected using tightened inspection.

4.3.2 Group A inspection. Group A inspection shall be performed in the order specified in table V.

TABLE V. Group A inspection.

Test requirement	Requirement paragraph	Test method paragraph
Subgroup I		
Visual and mechanical (end item)	3.1, 3.3, 3.4, 3.6, 3.10	4.7
Visual (solder inspection)	3.8.2	4.5.2
Subgroup II - Electrical		
Continuity	3.7.1	4.4.1
Insulation resistance	3.7.2	4.4.2
Dielectric withstanding voltage	3.7.3	4.4.3
Subgroup III - Mechanical		
Pull	3.8.3	4.5.3
Pull on connector components	3.8.4	4.5.4
Immersion	3.8.5	4.5.5

4.3.2.1 Major and minor defects. Major and minor defects shall be as defined in table VI and in the applicable parts of MIL-STD-252. Sampling shall be in accordance with ASQ Z1.4; the AQL shall be as specified in the contract (see 6.2). This listing should not be construed as being all-inclusive. Criteria for sample unit major-minor defect rates shall be as specified in the contract (see 6.2).

TABLE VI. Major and minor defects.

Major	Defect
100	Dimensions not as specified.
101	Material not as specified.
102	Scratches, cuts, and abrasions exposing conductors or conductor insulation.
103	Scratches, cuts, and abrasions, etc., exposing base metal.
104	Conductor or cable jackets showing through a molded surface.
105	Voids in the surface of the molded termination or section caused by insufficient filling.
106	Broken bond.
107	Incomplete bonding.
108	Electrical failure.
109	Missing parts.
110	Staycord not tied and secured in insert.
Minor	**Defect**
200	Scratches and abrasions of the molded termination or molded section.
201	Markings are dirty, smudged, or incorrectly placed, but legible.

4.3.2.2 Sampling plan. For the samples, the inspection level shall be level II in accordance with ASQ Z1.4. The AQL shall be as specified in the contract (see 6.2).

4.3.2.2.1 Rejection of sample units. If a sample unit is rejected because it failed the electrical tests specified in subgroup II, the contractor may withdraw the sample unit and rework it to correct the defects. These units shall then be subjected to the inspection tests.

4.3.2.3 Disposition of sample units. Sample units that have passed group A inspection are deliverable on the contract or order.

4.3.3 Group B inspection. Group B inspection, including sampling, shall conform to table VII and to the procedures for small-sample inspection levels. Group B inspection shall be performed on inspection lots that have passed group A inspection and on specimens selected from units of product that have been subjected to and met the group A inspection. The special inspection level shall be S-2.

TABLE VII. Group B inspection.

Test requirement	Requirement paragraph	Test method paragraph
Contact resistance variation [1]	3.7.4	4.4.4
Interchangeability	3.8.1	4.5.1

[1] This sampling may be performed by fabricating specimens of terminals attached to tinsel conductors, provided the samples are prepared in the same manner using the same materials as in the cable assemblies being subjected to group B inspection. The number of samples (terminals attached to tinsel conductors) shall be predicated on the sample size selected for group B inspection multiplied by the number of conductors within the cable assembly.

4.3.3.1 Disposition of sample units. Sample units that have passed group B inspection may be delivered on the contract or order.

4.3.4 Group C inspection. This inspection shall consist of the tests specified in tables VIII, IX, and X and shall be performed on sample units that have been subjected to and met group A and B inspections. Sample units shall be selected at random without regard to their quality. Sample units may be subjected to grand lot group C testing as explained in 6.4. A declaration of participation in grand lot testing must be made prior to submission of samples for group C inspection. If grand lot testing is not utilized, samples shall be selected from first units produced at the start of production on each contract. Delivery of cable assemblies that have passed group A and B inspection shall not be delayed pending results of group C inspection.

TABLE VIII. Group C-1 inspection.

Test requirement	Requirement paragraph	Test method paragraph	Number of test samples
Durability	3.8.6	4.5.6	2 units

TABLE IX. Group C-2 inspection.

Test requirement	Requirement paragraph	Test method paragraph	Number of test samples
Grind test	3.9.1	4.6.1	1 unit
Conductor insulation overcure	3.9.5	4.6.5	1 unit
Bend relief flexibility *	3.9.6	4.6.6	1 unit
Vibration *	3.9.7	4.6.7	1 unit
Ozone resistance *	3.9.8	4.6.8	1 unit

* See 4.3.4.4.

TABLE X. Group C-3 inspection.

Test requirement	Requirement paragraph	Test method paragraph	Number of test samples
Low temperature flex-life	3.9.2	4.6.2	1 unit
Thermal shock *	3.9.3	4.6.3	1 unit
Moisture resistance *	3.9.4	4.6.4	2 units

* See 4.3.4.4.

4.3.4.1 Group C-1 inspection. This inspection shall consist of the test specified in table VIII and shall be performed every 1000 units or periodically, as specified in the contract (see 6.2), whichever comes first.

4.3.4.2 Group C-2 inspection. This inspection shall consist of the tests specified in table IX and shall be performed every 6000 units or periodically, as specified in the contract (see 6.2), whichever comes first.

4.3.4.3 Group C-3 inspection. This inspection shall consist of the tests specified in table X and shall be performed every 12,000 units or periodically, as specified in the contract (see 6.2), whichever comes first.

4.3.4.4 Disposition of samples. Sample units that have been subjected to group C inspection shall not be delivered on contract or order, except those units that have undergone tests as indicated by an asterisk (*) in tables IX and X. These units may be delivered on contract or order provided they have been reconditioned and are subjected to, and meet the requirements of, group A inspection.

4.4 Electrical tests.

4.4.1 Continuity. Each circuit of each assembly shall be tested for continuity and correct connections between its terminations, using a potential of not more than 10 volts. A suitable indicator or automatic continuity tester may be used. The cable assemblies shall meet the requirements of 3.7.1.

4.4.2 Insulation resistance. Insulation resistance shall be measured in accordance with MIL-STD-202-302, test condition A. The insulation resistance shall be measured between each conductor and the remaining conductors connected together to shielding and metal shell, when present. The cable assemblies shall meet the requirements of 3.7.2.

4.4.3 Dielectric withstanding voltage. Dielectric withstanding voltage testing shall be performed in accordance with MIL-STD-202-301. A potential of 1000 ±10 volts direct current shall be applied for one minute when performed manually. The potential shall be applied between each conductor and the remaining conductors connected together to shielding and metal shell, when present. The cable assemblies shall meet the requirements of 3.7.3. This test shall be performed only once on units to be furnished on contract. This test may be performed during final inspection.

4.4.4 Contact resistance variation (assemblies using tinsel conductors only). Each terminal shall be clamped so that it cannot move and the conductor shall be bent at the point of attachment to the terminal so that it is moved 90 degrees to each side of the axial position for a total excursion of 180 degrees. The stressing shall be done in two mutually perpendicular planes. The resistance variation shall be measured with a bridge or by the use of an electronic voltmeter to measure the voltage variation, with a current of 0.30 to 0.50 ampere flowing through the conductors and mated connectors. Contact resistance variation shall meet the requirements of 3.7.4.

4.5 Mechanical tests.

4.5.1 Interchangeability. Contact locations and interfacial dimensions of the connector as specified in the applicable connector specification or drawing, shall be measured. Gages, when specified in the drawing or contract (see 6.2), shall be used to determine conformance to the physical and functional interchangeability requirements. Gaging may be performed prior to assembly provided assembly of the connector components will not cause a dimensional change to the connector. Acceptance shall be in accordance with the requirements of 3.8.1.

4.5.2 Soldering. Soldering inspection shall be performed during the manufacturing process using a minimum 4X magnification. All connections shall be soldered and meet the requirements of 3.8.2.

4.5.3 Pull test. Cable assemblies shall be subjected to a static load, which shall be applied between the connector and cable with at least two feet of cable subjected to the load. The pull shall be applied parallel to the axis of the cable. A static load of not less than 20 pounds shall be applied to cable assemblies having cable of 0.5-inch diameter or less. Cable assemblies having a cable diameter exceeding 0.5 inch and less than 0.75 inch shall be subjected to a static load of 40 pounds. Cable assemblies having cable diameters over 0.75 inch shall be subjected to a static load of 60 pounds. The pull test shall be performed on each end terminated with a connector. The cable assemblies shall meet the requirements of 3.8.3 following the test.

4.5.4 Pull test on connector components. Terminals crimped to tinsel conductors and crimped sleeves inserted into a connector shall be subjected to a three-pound minimum pull. Terminals crimped to stranded or solid conductors shall be subjected to a 12-pound pull. Taper pins inserted into a connector shall be subjected to a 10-pound pull-out force. Tested components shall meet the requirements of 3.8.4.

4.5.5 Immersion. The cable assemblies shall be immersed in three feet of water at room temperature for a period of one hour. Cable assemblies with a watertight connector on one end only and less than three feet long shall have the watertight connector immersed to a depth not less than 75 percent of the length of the cable assembly. The cable assemblies shall meet the requirements of 3.8.5.

4.5.6 Durability. Measure the force required to connect and disconnect the connectors prior to and following the durability test. The connectors shall be mated and unmated to their mating connector or like (hermaphroditic) connectors 500 times and shall meet the requirements of 3.8.6.

4.6 Service tests.

4.6.1 Grind test. Molded and potted components shall be ground down to one inch, or one half of the component thickness, whichever is less. Ground surfaces shall be examined for air bubbles and other irregularities that are caused by poor molding or potting procedures or materials. Grinding shall be performed using silicon carbide-coated abrasive sheets in accordance with UAMA B74.18, grit size 150 to 220. An equivalent abrasive is acceptable. The assembly shall meet the requirements of 3.9.1.

4.6.2 Low temperature flex-life. The cable assembly containing molded sections or heat-shrunken transitions shall be aged in a circulating air oven for a minimum of 48 hours at 71 ±1 °C. The cable assembly shall then be conditioned for a minimum of 48 hours at the lower limit of the cable operating temperature range. If not specified, the temperature shall be -55 ±1 °C. This temperature shall be continuously recorded during conditioning and testing. Each crotch or molded section shall be held in a mechanical device so that the portion of the cable entering the molded section flexes when the cable is flexed. The cable shall be flexed mechanically. Any part of a mechanical device that will be in contact with the test specimen shall be cold-conditioned. At the end of the conditioning period, and while at the conditioning temperature, the cable shall be flexed rapidly for 30 cycles through a 180 degree arc (±90 degrees off cable axis). The flexing procedure shall be repeated in a plane 90 degrees to the plane of initial flexing and parallel to the cable axis. At the conclusion of the test, the specimen shall be

examined visually at room temperature under 3X magnification. The cable assembly shall meet the requirements of 3.9.2.

4.6.3 Thermal shock. The cable assemblies shall be tested in accordance with MIL-STD-202-107, test condition A, and meet the requirements of 3.9.3.

4.6.4 Moisture resistance. The cable assemblies shall be tested as specified in 3.9.4 in accordance with MIL-STD-202-106 and meet the requirements of 3.7.1 and 3.7.2. The following conditions shall apply:

a. Measure initial continuity (see 4.4.1) and insulation resistance (see 4.4.2).
b. Cable assemblies shall be placed in the chamber unmated and fully exposed. However, the connectors may be placed in such a manner so as to prevent water accumulation on the contact face of the connector.
c. Cable assemblies under test shall not be subjected to electrical loading during exposure.
d. MIL-STD-202-106: The vibration test as required in step 7 is not required.
e. MIL-STD-202-106: After completion of step 6 cycling, and prior to the opening of the test chamber, condition the cable assemblies for 24 hours at 23 ±1 °C and 50 ±10 percent relative humidity. Following the conditioning period, the cable assemblies shall meet the requirements of 3.9.4.

4.6.5 Conductor insulation overcure. The insulated conductor shall be removed from that section of cable that has been subjected to heat through molding or heat-cured potting. The insulation with conductors removed shall be of a sufficient length to permit testing per method 3031.1 of FED-STD-228. The conductor insulation shall meet the requirements of 3.9.5.

4.6.6 Bend relief flexibility. Each bend relief in the cable assembly shall be manually subjected to 500 continuous flexure cycles, at room temperature, through a 180-degree arc, at approximately 30 cycles per minute. The connector shall be held in place so that the bend relief is free to flex with the cable in one direction through 90 degrees from the axially in-line starting position, back to the starting position, then through 90 degrees in the opposite direction, and return to the starting position. Following this test, the cable assembly shall meet the requirements of 3.9.6.

4.6.7 Vibration. The assembly shall be tested as specified in MIL-STD-202-201. Following this test, the assemblies shall meet the requirements of 3.9.7. The following details and exceptions shall apply:

a. Approved mating receptacles shall be rigidly mounted and the cable assembly connectors mated with the connector-cable axis in the vertical plane.
b. Resonance-free mounting in accordance with MIL-STD-202-201 is not applicable.
c. Test and measurements during vibration are not required.

4.6.8 Ozone resistance. The ozone resistance pre-conditioning, ozone concentration, temperature, and any other chamber conditions shall be the same as specified for the bend relief elastomer (rubber) and cable jacket. If no ozone resistance test is specified for the bend relief elastomer, the ozone resistance test shall be the same as specified for the cable jacket material. The bend relief and adjacent section of cable shall be so constrained that the bend relief is curved

in a 90-degree arc while in the ozone chamber. The assembly shall meet the requirements of 3.9.8.

4.6.9 Cable re-verification. The elongation test for cable re-verification shall be in accordance with method 3031.1 of FED-STD-228, and meet the requirements of 3.9.9.

4.6.10 Durometer hardness. Durometer hardness shall be measured in accordance with method 3021 of FED-STD-601. The tolerance shall be ±5. Durometer hardness shall be as specified on the applicable drawings and shall meet the requirements of 3.9.10.

4.6.11 Material reversion. The molding, potting, insulating, and jacketing material shall be tested using specimens approximately 4 inches square by 0.125 inch thick for durometer hardness Shore "A" testing (see 4.2.1.1.2). Then, they shall be placed in a chamber maintained at 100 ±1 °C and 95 ±2 percent relative humidity without condensation for 28 days. The specimens shall be so arranged that they do not come into contact with each other or with the chamber walls or floor. After conditioning, the specimens shall be tested in accordance with 3.9.11.

4.7 Visual and mechanical examination. The cable assemblies shall be examined for the defects listed in 4.3.2.1, and to verify that the materials, design, construction, physical dimensions, marking, and workmanship are in accordance with paragraphs 3.1, 3.3, 3.4, 3.5, 3.6, and 3.10.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. 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 assemblies covered by this specification are intended for use in electronic, communication, and associated electrical equipment.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.
b. Quantity of cable assemblies required.
c. Detail specification, specification sheet, or drawing (see 3.1).
d. First article inspection, if required (see 3.2).
e. Cable assembly marking requirements, if different from those specified (see 3.4).

f. Type of connectors required (see 3.5)
g. Length of cable assembly (see 3.6.2).
h. Cable assembly tolerances, if different from those specified (see 3.6.2.1).
i. Durometer hardness testing, if required (see 3.9.10).
j. Materials inspection, if different from that specified (see 4.2.1).
k. First article inspection sample size, if different from that specified (see 4.2.2).
l. AQL (see 4.2.1.1.1, 4.2.1.1.2, 4.3.2.1, 4.3.2.2).
m. Unit of product, if different from that specified (see 4.3.1.2).
n. Major-minor defect rates (see 4.3.2.1).
o. Group C lot sampling schedule for conformance testing, if required (see 4.3.4.1, 4.3.4.2, and 4.3.4.3).
p. Gages for interchangeability testing, if required (see 4.5.1).
q. Packaging requirements (see 5.1).

6.3 First article inspection. Information pertaining to first article inspection of cable assemblies covered by this specification should be obtained from the procuring activity for the specific contracts involved (see 3.2).

6.4 Grand lot testing. Grand lot, group C inspection is a means of eliminating costly and repetitive testing of cable assemblies on multiple contracts that use the same type of connectors and cable and are assembled in essentially the same manner.

a. Each cable assembly factory having two or more contracts for cable assemblies meeting the above criteria may qualify for grand lot testing by submitting samples from current production for the tests specified in the group C tables.
b. Potted and molded cable assemblies may be subject to grand lot inspection when multiple contracts exist for the same cable assembly type, regardless of length. These assemblies should not be grouped with any other grand lot testing.
c. Samples submitted for each grand lot, group C inspection will be of one type. For example, sample units employing the same type of connectors and cable for each assembly. Sample units should be selected at random from one contract.
d. Grand lot, group C testing will be performed on a calendar basis as specified in 4.3.4.1, 4.3.4.2, 4.3.4.3, and 6.2.

6.5 Definitions.

6.5.1 Cable assemblies and cord assemblies. Cable assemblies and cord assemblies are procurement items consisting of definite lengths of finished cable or cord, respectively, and having processed terminations at one or both ends (see 1.1).

6.5.2 Bend relief. A bend relief (flex-relief) is a device (e.g., tube, spiral, cone, or boot) placed around a cable (after the cable is manufactured), or a portion of a cable, to prevent a sharp radius of curvature when the cable is bent or flexed. The bend relief may not necessarily be secured (molded or bonded) to the cable jacket, but it is secured (molded, bonded, clamped) to the device (connector, equipment or component housing, or splice) (see 3.9.6).

6.5.3 Potted termination. A potted termination is one in which an insulating material encloses the terminated conductors, filling all voids inside the back end of the connector or equipment housing.

6.5.4 Molded termination. A molded termination is one which has a bend relief or strain-relief bonded to the connector or equipment housing and to the cable jacket. The termination may be a one-step operation of potting or molding a material around the connector pins and terminated wires and over the connector and cable; or a two-step operation in which the back end of the connector and the wires are first potted and then the bend relief or flex-relief is molded over the connector and cable.

NOTE: The term "equipment" as used above includes any device in a housing molded to the cable jacket.

6.5.5 Premolded boot. A premolded boot is normally a nylon or rubber device molded to a fixed shape to fit a given-sized connector. The boot is slipped over the cable, the cable is installed in the connector, and the boot is slipped over the connector-cable interface and attached to the connector with an adhesive or a metal ring.

6.5.6 Transition. A transition is a device that provides a watertight covering to a cable splice, crotch or cable termination-to-connector housing.

6.6 Connector durability. In some types of molded terminations, the connector shell surrounds only the insulator and front end of the pins. The coupling mechanism for mating connectors cannot be assembled until the cable and nosepiece are wired and the termination molded. Therefore, some tests, which are usually included in connector specifications, cannot be performed until the cable termination is completed (see 3.8.6).

6.7 Subject term (key word) listing.

Audio
Bend relief
Connector
Data
Insulation
Interconnect
Interconnecting
Jacket
Molded termination
Patch
Potted termination
Pre-molded
Pull test
Teletype
Termination

6.8 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.

Custodians:
Army - CR
Navy - EC
Air Force - 85
DLA - GS

Review Activities:
Army - AR, AT, CR4, EA, MI
Navy - AS, MC, OS
Air Force - 19

Preparing Activity:
DLA - GS8

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NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at https://assist.dla.mil/.