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SUPERSEDING
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MILITARY SPECIFICATION

CABLE ASSEMBLIES AND CORD ASSEMBLIES, ELECTRICAL

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

1.1 This specification covers the minimum requirements unless otherwise specified for cable and cord assemblies (referred to as cable assemblies (see 6.5.1)), except for radio frequency coaxial cable assemblies.

2. APPLICABLE DOCUMENTS

2.1 Government Documents.

"2.1.1 Specifications and Standards. The following specifications and standards, form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation."

SPECIFICATIONS

FEDERAL

P-C-451	Coated Abrasive, Cloth, Aluminum Oxide or Silicon Carbide

MILITARY

MIL-T-3530	Thread and Twine, Mildew Resistant or Water Repellent Treated
MIL-I-3930	Insulating and Jacketing Compounds, Electrical (for Cables, Cords, and Wires)
MIL-M-13231	Marking of Electronic Items
MIL-P-15024	Plate, Tags and Bands for Identification of Equipment

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-ED-TO, Fort Monmouth, New Jersey 07703-5016, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) at the end of this document or by letter.

FSC 5995

MILITARY

MIL-I-23053	Insulation Sleeving, Electrical, Heat Shrinkable, General Specification for
MIL-M-24041	Molding and Potting Compound, Chemically Cured, Polyurethane
MIL-I-45208	Inspection System Requirements
MIL-C-55442	Cable Assemblies and Cord Assemblies, Packaging of
MIL-M-81531	Marking of Electrical Insulating Materials
MIL-P-15024/8	Band, Identification, Cable Assembly, Type K? Heat Shrinkable Tubing
MIL-I-23053/5	Insulation Sleeving, Electrical, Heat Shrinkable, Polyolefin, Flexible, Crosslinked

STANDARDS

FEDERAL

FED. TEST METHOD STD NO. 228	Cable and Wire, Insulated; Methods of Testing
FED-STD-601	Rubber: Sampling and Testing

MILITARY

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-202	Test Methods for Electronic and Electrical Component Parts
MIL-STD-252	Classification of Visual and Mechanical Defects for Equipment, Electronic, Wired, and other Devices
MIL-STD-454	Standard General Requirements for Electronic Equipment
MIL-STD-45662	Calibration System Requirements
MS-75027	Cable And Cord Assemblies, Electrical, Used With Communication Equipment: Standard Tolerance For.

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

2.2 Order of Precedence. In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede 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 detailed specification, specification sheet or drawing (See 6.2). In the event of 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 2.1.

3.2 First Article Inspection. When required by the contract or purchase order, first article inspection shall be as specified in 4.5. First article inspection shall consist of all tests specified herein, and shall include Materials inspection 4.4. Tests for insulation and dielectric withstanding voltage shall be performed manually and the insulation resistance readings shall be recorded.

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 4.3)

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

3.3.2 Solders. Solders shall be in accordance with MIL-STD-454, Requirement 5.

3.4 Marking. Marking shall conform to MIL-M-13231. Size of characters and properties of the marking shall be as specified in MIL-M-81531. Unless otherwise specified (See 3.1), the marking shall be on heat shrinkable tubing, type K2 per MIL-P-15024/8 or class 1 (yellow) per MIL-I-23053/5. All cable assemblies shall have markers applied as specified by the applicable drawings, contract or order.

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

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 MIL-T-3530, using Type I Class 1 mildew inhibiting agent, with the following requirements waived:

First article sample approval; acidity (pH); mildew-resistance; color; breaking strength; length per pound; and sewing quality.

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 [illegible], 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 protector.

3.6.1.1 Cut Lengths. Prior to attachment of any [illegible] terminals and connectors, the cut lengths of the cable or cord, prepared for terminations, shall be immersed in the specified [illegible] solution as follows:

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 5 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 an insulation or jacket or natural or synthetic rubber, or a plastic, which is applied with the use of heat.

3.6.2 Length Tolerance of Cable Assembly. The tolerance of overall length of the cable assembly shall be in accordance with Military Standard MS-75027 or as otherwise indicated in the applicable drawing or contract.

3.7 Electrical Requirements.

3.7.1 Continuity. Each circuit shall be continuous within the assembly, when tested as specified in 4.7.1.

3.7.2 Insulation Resistance. The insulation resistance of the cable assembly shall not be less than 100 megohms when tested as specified in 4.7.2, except the insulation resistance of a shielded conductor shall be not less than 30 megohms.

3.7.3 Dielectric Withstanding Voltage. There shall be no evidence of voltage breakdown when tested as specified in 4.7.3.

3.7.4 Contact-Resistance Variation (Applicable only to Assemblies Using Tinsel Conductors). The contact-resistance variation between each terminal and the tinsel conductor shall not exceed 0.06 ohm when tested as specified in 4.7.4.

3.8 Mechanical Requirements.

3.8.1 Interchangeability. Connectors shall be tested as specified in 4.8.1. Like units, assemblies and sub-assemblies shall be physically and functionally interchangeable, without modification. Individual items shall not be handpicked for fit.

3.8.2 Soldering All electrical connections shall be soldered in accordance with MIL-STD-454, Requirement 5 and tested as specified in 4.8.2.

3.8.3 Pull. After being subjected to the test specified in paragraph 4.8.3, the cable assembly shall show no straining of individual conductors (when visible without major disassembly), or physical damage and shall meet the requirements of Continuity 3.7.1, Insulation Resistance 3.7.2, Dielectric Withstanding Voltage 3.7.3 and Immersion 3.8.4. 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 out of the conductor or connector when subjected to test specified in 4.8.4

3.8.5 Immersion (Cable Assemblies With Watertight Connector(s) And Splices Covered With Molded Rubber Or Shrinkable Tubing). Cable assemblies shall be subjected to the test specified in 4.8.5. There shall be no evidence of moisture penetration into the connector(s), splice or molded sections. The cable assemblies shall meet the requirements of insulation resistance, paragraph 3.7.2.

3.8.6 Durability. Connectors that must be assembled to given dimensions, potted and/or molded in accordance with the information contained on the cable assembly drawing shall be subjected to the Durability test specified in 4.8.6. 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% of that prior to performing the Durability test. (See 6.6).

3.9 Service Conditions

3.9.1 Grind Test (Cable Assemblies With Molded or Potted Components Only). After grinding as specified in 4.9.1, molded and potted components of the cable assembly shall show no voids or pits when viewed with taree power magnification.

3.9.2 Low-Temperature Flexibility (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 4.9.2. 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 Continuity 3.7.1., Insulation resistance 3.7.2, and Dielectric withstanding voltage 3.7.3.

3.9.3 Thermal Shock. After being subjected to the test specified in 4.9.3, the assembly shall not exhibit any physical damage. Following the test, the cable assembly shall meet the requirements of Continuity 3.7.1, Insulation Resistance 3.7.2 and Dielectric withstanding voltage 3.7.3.

3.9.4 Moisture Resistance (Cable Assemblies With Watertight Connector(s)). After testing as specified in 4.9.4, 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 Insulation resistance 3.7.2.

3.9.5 Conductor Insulation Overcure (Molded or Heat-Cured potted Cable Assemblies Only). The same assembly which has met the requirements of 3.9.3 shall be tested as specified in 4.9.5. 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 ungaged elongation requirement of MIL-I-3930.

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 4.9.6. 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 Continuity 3.7.1, Insulation resistance 3.7.2, and Dielectric withstanding voltage 3.7.3. (See 6.5.2).

3.9.7 Vibration. The cable assembly shall be tested as specified in 4.9.7. 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 Continuity 3.7.1, Insulation Resistance 3.7.2 and Dielectric withstanding voltage 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 4.9.8. 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 cable shall be tested in accordance with 4.9.9. The test shall be performed on cable manufactured 12 months prior to the date of shipment of the cable assembly to the government. The test specimen shall meet the unaged elongation requirements listed in the applicable tables of MIL-I-3930 or the applicable material specification.

3.9.10 Durometer Hardness. The durometer hardness Shore "A" of a molded termination and other molded sections shall be measured as specified in 4.9.10 and shall be not less than 50 Shore "A" durometer or as specified on the drawing or in the contract.

3.9.11 Reversion (Polyurethane and Polyacrylic Compounds Only). Polyurethane and polyacrylic molding, potting, insulating, or jacketing compounds used on cable asemblies shall be subjected to the test specified in 4.9.11 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 3.9.10. 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 serviceablity when tested as specified in 4.10.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for Inspection. Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor 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 supplies and services conform to prescribed requirements.

4.2 Test Conditions.

4.2.1 Test Equipment and Inspection Facilities. Test and measuring equipment and inspection facilities of sufficient accuracy, quality and quantity to permit performance of the required inspection shall be established and maintained by the contractor. The establishment and maintenance of a calibration system to control the accuracy of the measuring and test equipment shall be in accordance with MIL-STD-45662, including automatic test equipment.

4.2.2 Automatic Testing. The inspection for Continuity 4.7.1, Insulation resistance 4.7.2 and Dielectric withstanding voltage 4.7.3 may be performed by automatic means. The automatic test equipment shall be programmed with the Continuity test first. Insulation resistance and Dielectric withstanding voltage may be performed simultaneously in less than one

minute provided that the current flow within the circuit is linear and not subject to sudden increases. The automatic test equipment shall be manually reset if failure occurs. See Para. 4.7.3 for frequency of dielectric test.

4.3 Classification of Inspections. The inspections specified herein are classified as follows:

a. Materials Inspection (See 4.4).
b. First Article Inspection (See 4.5)
c. Quality Conformance Inspection (See 4.6).

4.4 Materials Inspection. Materials inspection shall consist of the tests in Table I and any other tests required. Other materials inspection not in Table I 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.

TABLE I Materials Inspection

Inspection	Requirement Paragraph	Test Method Paragaph
Cable Re-verification	3.9.9	4.9.9
Durometer Hardness	3.9.10	4.9.10
Material Reversion	3.9.11	4.9.11

4.4.1 Sampling

4.4.1.1 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 acceptable quality level (AQL) of 6.5.

4.4.1.2 Other Tests. Unless otherwise specified, the AQL for all other material inspections shall be 6.5.

4.5 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 which have been produced with equipment and procedures to be used in production (See 3.2).

4.5.1 Sample Size. Fifteen sample units shall be submitted for First Article inspection, unless an alternate quantity is specified in the contract or order.

4.5.2 Testing Routine. All of the First Article samples shall be subjected to Groups A and B inspection. Two samples shall be subjected to the requirements of Moisture resistance (paragraph 3.9.4) only. Two

samples shall be subjected to the requirements of Ozone resistance (paragraph 3.9.8) only. One sample shall be subjected to the requirements of Grind test (paragraph 3.9.1) and Conductor insulation overcure (paragraph 3.9.5) only. Four samples shall be subjected to the following requirements in the order shown: Thermal shock (paragraph 3.9.3), Low temperature flexibility (paragraph 3.9.2), Vibration (paragraph 3.9.7), Bend relief flexibility (paragraph 3.9.6), and Durability (paragraph 3.8.6). All samples shall be selected at random for each test. Balance of 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 6.3.1).

4.5.3 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.

4.6 Quality Conformance Inspection

4.6.1 Inspection Of Product For Delivery. Inspection of product for delivery shall consist of Group A, B, and C inspection except as otherwise indicated.

4.6.1.1 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.

4.6.1.2 Unit of Product. The unit of product, for purposes of sampling, shall be each cable assembly as specified in the contract or order.

4.6.1.3 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.

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

4.6.1.5 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.

4.6.2 Group A Inspection. Group A inspection shall be performed in the order specified in Table II.

TABLE II Group A Inspection

Inspection	Requirement Paragraph	Test Method Paragapn	AQL (Percent Defective) Major	Minor
Subgroup I				
Visual & Mechanical (End Item)	3.1, 3.3, 3.4, 3.6, and 3.10	4.10	1.0	4.0
Visual (Solder Inspection)	3.8.2	4.8.2	100% in process	
Subgroup II				
Electrical				
Continuity	3.7.1	4.7.1		
Insulation Resistance	3.7.2	4.7.2	0.65	-
Dielectric Withstanding Voltage	3.7.3	4.7.3		
Subgroup III				
Mechanical				
Pull	3.8.3	4.8.3		
Pull on Connector Components	3.8.4	4.8.4	1.0	-
Immersion	3.8.5	4.8.5		

4.6.2.1 Major and Minor Defects. Major and minor defects shall be as defined below and in the applicable parts of MIL-STD-252. Sampling shall be in accordance with MIL-STD-105, the AQL shall be as indicated in Table II. This listing should not be construed as being all-inclusive. Any sample unit which has one major and/or three minor defects shall be a defective.

Major Defects:

Dimensions not as specified.
Material not as specified.
Scratches, cuts, and abrasions causing exposure of conductors or conductor insulation.

Major Defects:

Scratches, cuts, and abrasions, etc., causing exposure of base metal.
Conductor or cable jackets showing through a molded surface.
Voids in the surface of the molded termination or molded section caused by insufficient filling.
Broken bond.
Incomplete bonding.
Electrical failure.
Missing parts.
Staycord not tied and secured in insert.

Minor Defects:

Scratches and abrasions of the molded termination or molded section.
Markings are dirty, smudged, or incorrectly placed, but legible.

4.6.2.2 Sampling Plan. For the samples, the inspection level shall be level II in accordance with MIL-STD-105. The AQL shall be as specified in Table II.

4.6.2.2.1 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.

4.6.2.3 Disposition of Sample Units. Sample units which have passed Group A inspection are deliverable on the contract or order.

4.6.3 Group B Inspection. Group B inspection, including sampling, shall conform to Table III 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 III Group B Inspection

Inspection	Requirement Paragraph	Test Method Paragaph	AQL (Percent Defective) Major	Minor
Contact-resistance variation*	3.7.4	4.7.4	6.5	
Interchangeability	3.8.1	4.8.1	4.0	

*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.

4.6.3.1 Disposition of Sample Units. Sample units which have passed Group B inspection may be delivered on the contract or order.

4.6.4 Group C Inspection. This inspection shall consist of the tests specified in Tables IV, V, and VI and shall be performed on sample units that have been subjected to and met Group A and B inspection. 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 para 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 which have passed Group A and B inspection shall not be delayed pending results of Group C inspection.

4.6.4.1 Group C-1 Inspection. This inspection shall consist of the tests specified in Table IV and shall be performed every month or every 1000 units, whichever comes first.

TABLE IV Group C-1 Inspection

Inspection	Requirement Paragraph	Inspection Paragaph	Sampling
Durability	3.8.6	4.8.6	Two each

4.6.4.2 Group C-2 Inspection. This inspection shall consist of the tests specified in Table V and shall be performed every three months of every 6000 units, whichever comes first.

TABLE V Group C-2 Inspection

Inspection	Requirement Paragraph	Inspection Paragraph	Sampling
Grind Test	3.9.1	4.9.1	1 unit
Conductor Insulation Overcure	3.9.5	4.9.5	1 unit
Bend Relief Flexibility*	3.9.6	4.9.6	1 unit
Vibration*	3.9.7	4.9.7	1 unit
Ozone Resistance*	3.9.8	4.9.8	1 unit

4.6.4.3 Group C-3 Inspection. This inspection shall consist of the tests specified in Table VI and shall be performed each year or every 12000 units, whichever comes first.

TABLE VI Group C-3 Inspection

Inspection	Requirement Paragraph	Inspection Paragraph	Sampling
Low Temperature Flex-life	3.9.2	4.9.2	1 unit
Thermal Shock*	3.9.3	4.9.3	1 unit
Moisture Resistance*	3.9.4	4.9.4	2 units

4.6.4.4 Disposition of Samples. Those sample units subjected to Group C inspection shall not be delivered on contract or order, except those units which have undergone tests indicated by an asterisk (*), provided the units are reconditioned and are subjected to and meet the requirements of Group A inspection.

4.6.4.5 Noncompliance. No failures shall be allowed in Group C inspection. If a sample unit fails to pass Group C inspection, the supplier shall take corrective action on the material or process or both, as warranted, and on all units of production which can be corrected and which were manufactured under essentially the same conditions, with essentially the same materials, processes, etc., and which are considered subject to the same failure. Acceptance of the product shall be discontinued until corrective action, acceptable to the government, has been taken. After the corrective action has been taken, Group C inspection shall be repeated on additional sample units (all inspections or the inspection that the original sample failed, at the option of the government). Groups A and B inspection may be reinstituted, however, final acceptance shall be withheld until the Group C reinspection has shown that the corrective action was successful. In the event of failure after reinspection, information concerning the failure and the corrective action taken shall be furnished to the cognizant inspection activity.

4.6.5 Inspection of Packaging. The sampling and inspection of the preservation-packaging, packing and container marking shall be in accordance with the requirements of MIL-C-55442.

4.7 Electrical Tests

4.7.1 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.

4.7.2 Insulation Resistance. Insulation resistance shall be measured in accordance with Method 302 of MIL-STD-202, Test Condition A. The insulation resistance shall be measured betweeen each conductor and the remaining conductors connected together to the shield(s) and metallic shell(s), when present. The cable assemblies shall meet the requirements of 3.7.2.

4.7.3 Dielectric Withstanding Voltage. Dielectric withstanding voltage shall be performed in accordance with Method 301 of MIL-STD-202. A dc potential of 1000 ± 10 volts shall be applied for one minute when performed manually. (See para. 4.2.2.). The potential shall be applied between each conductor and the remaining conductors connected together to the shield(s) and metallic shell(s), 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.

4.7.4 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.

4.8 Mechanical Tests

4.8.1 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 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

4.8.2 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.

4.8.3 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 twenty pounds shall be applied to cable assemblies having cable of one half inch diameter or less. Cable assemblies having a cable diameter exceeding one half inch and less than three quarter inch shall be subjected to a static load of 40

pounds. Cable assemblies having cable diameters over three quarters 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.

4.8.4 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 twelve pound pull. Taper pins inserted into a connector shall be subjected to ten pound pull out force. Tested components shall meet the requirements of 3.8.4.

4.8.5 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 three-quarters of the length of the assembly. The cable assemblies shall meet the requirements of 3.8.5.

4.8.6 Durability. The connectors shall be mated and unmated to their mating connector or like (hermaphroditic) connectors 500 times and meet the requirements of 3.8.6.

4.9 Service Tests.

4.9.1 Grind Test. Molded and potting components shall be ground down to one inch, or half of thickness, whichever is less. Ground surfaces shall be examined for air bubbles and other irregularities which are caused by poor molding or potting procedures or materials. Grinding shall be done using coated abrasive in accordance with P-C-451, type II, class I, grit size 150 to 220; an equivalent abrasive is acceptable. The assembly shall meet the requirements of 3.9.1

4.9.2 Low-Temperature Flex-Life. The cable assembly containing molded sections or heat-shrunken transition 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 termperature 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 which 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 from 0 degrees). The flexing procedure shall be repeated in a plane 90 degrees to the plane of initial flexing. 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.

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

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

a. Measure initial Continuity 4.7.1 and Insulation resistance 4.7.2.

b. No load during exposure.

c. Vibration at Step 7 is not required.

d. 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 ± ten percent relative humidity. Following the conditining period, the cable assemblies shall meet requirements of Para. 3.9.4.

e. 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.

4.9.5 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 of Federal Test Method Standard No. 228. The conductor insulation shall meet the requirements of 3.9.5

4.9.6 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.

4.9.7 Vibration. The assembly shall be tested as specified in method 201 of MIL-STD-202. Following the 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-contact face in the horizontal plane.

b. Resonance test, not applicable.

c. Test and measurements during vibration are not required.

4.9.8 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.

4.9.9 Cable Re-Verification. The elongation test for cable re-verification shall be in accordance with method 3031 of Federal Test Method Standard No. 228, and meet the requirements of 3.9.9.

4.9.10 Durometer Hardness. Durometer hardness shall be measured in accordance with method 3021 of Federal Test Method Standard No. 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.

4.9.11 Material Reversion. The molding, potting, insulating, and jacketing material shall be tested using specimens approximately four inches square by 1/8 inch thick for Durometer Hardness Shore "A" (See 4.4.1.2). 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 arranged so they do not come into contact with each other nor with the chamber walls or floor. After conditioning, the specimens shall be tested in accordance with 3.9.11.

4.10 Visual and Mechanical Examination. The cable assemblies shall be examined for defects listed in 4.6.2.1, 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 Requirements. The requirements for packaging shall be in accordance with MIL-C-55442.

6. NOTES

6.1 Intended Use. Cable assemblies covered by this specification are intended for use in electronic, communication, and associated electrical equipment.

6.2 Ordering Data. Procurement documents should specify the following:

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

b. Length of cable assembly desired (See 3.6.2).

c. Cable assembly marking requirements (See 3.4).

d. Levels of the preservation-packaging and packing desired as specified in MIL-C-55442 (See 5.1).

e. First Article inspection including the number of samples to be submitted if the quantity differs from that specified in 4.5.1.

f. Requirement for inspection system in accordance with MIL-I-45208.

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 which use the same type 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 shall not be grouped with any other Grand Lot Testing.

c. Samples submitted for each Grand Lot, Group C inspection shall be of one type (i.e. same type connector(s) and cable on each assembly sample). Sample units shall be selected at random from one contract.

d. Grand Lot, Group C Testing will be performed on a calendar basis as specified in tables IV, V, and VI.

6.5 Definitions

6.5.1 Cable Assemblies and Cord Assemblies. Cable assemblies and cord assemblies are procurement items consisting of definite lengths of 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, boot) placed around a cable (after the cable is manufactured) or 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 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 water tight covering to a cable splice, crotch or a 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 Revision Changes. Asterisks are not used in this revision to identify changes with respect to the previous issue of the specification due to the extensiveness of the changes.

CUSTODIANS:

Army - CR
Navy - EC
Air Force - 85

REVIEW ACTIVITIES:

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Navy - OS, AS
Air Force - 17, 99
DLA - GS

USER ACTIVITIES:

Army - ME
Navy - MC
Air Force - 11, 19

Preparing Activity:
Army - CR

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1 DOCUMENT NUMBER	2 DOCUMENT TITLE
MIL-C-3885F	Cable Assemblies and Cord Assemblies, Electrical

3a NAME OF SUBMITTING ORGANIZATION	4 TYPE OF ORGANIZATION *(Mark one)*
	☐ VENDOR
b ADDRESS *(Street, City, State, ZIP Code)*	☐ USER
	☐ MANUFACTURER
	☐ OTHER *(Specify)* _____

5 PROBLEM AREAS

a. Paragraph Number and Wording

b. Recommended Wording

c. Reason/Rationale for Recommendation

6 REMARKS

7a NAME OF SUBMITTER *(Last, First, MI)* – Optional	b WORK TELEPHONE NUMBER *(Include Area Code)* – Optional
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