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MILITARY SPECIFICATION

CABLE AND HARNESS ASSEMBLIES, ELECTRICAL, MISSILE SYSTEM: GENERAL SPECIFICATION FOR

This specification is approved for use by the U.S. Army Missile Command, Department of the Army, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers the general requirements for flexible, branched and non-branched, multi-conductor cable assemblies (see 6.4.3) and harness assemblies (see 6.4.9) used in missile systems.

1.2 Classification. Cable assemblies and harness assemblies shall be of the following types, as specified (see 6.2):

Type I	-	Interior ground support cable assemblies, jacketed
Type II	-	Exterior ground support cable assemblies, jacketed
Type III	-	Missile harness assemblies
Type IV	-	Missile cable assemblies (including umbilical cable).

2. APPLICABLE DOCUMENTS

2.1 Government documents.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, U.S. Army Missile Command, Atten: AMSMI-RD-SE-TD-ST, Redstone Arsenal, AL 35898-5270 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A FSC 1410

2.1.1 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).

SPECIFICATIONS

FEDERAL

QQ-B-575	-	Braid, Wire (Copper, Tin-Coated, or Silver-Coated, Tubular or Flat)
TT-S-1732	-	Sealing Compound; Pipe Joint and Thread, Lead Free, General Purpose

MILITARY

MIL-C-17	-	Cables, Radio Frequency, Flexible and Semirigid, General Specification for
MIL-I-631	-	Insulation, Electrical, Synthetic-Resin Composition, Nonrigid
MIL-T-713	-	Twine, Fibrous: Impregnated, Lacing and Tying
MIL-R-3065	-	Rubber, Fabricated Products
MIL-C-5015	-	Connectors, Electrical, Circular Threaded, AN Type, General Specification for
MIL-W-5086	-	Wire, Electric, Polyvinyl Chloride Insulated, Copper or Copper Alloy
MIL-R-6855	-	Rubber, Synthetic Sheets, Strips, Molded or Extruded Shapes, General Specification for
MIL-S-8516	-	Sealing Compound, Polysulfide Rubber, Electric Connectors and Electric Systems, Chemically Cured
MIL-C-10544	-	Connectors, Plug and Receptacle (Electrical, Audio, Waterproof, Ten Contact, Polarized)
MIL-C-13777	-	Cable, Special Purpose, Electrical: General Specification for
MIL-W-16878	-	Wire, Electrical, Insulated, General Specification for
MIL-P-21922	-	Plastic Rods and Tubes, Polyethylene
MIL-I-22129	-	Insulation Tubing, Electrical, Polytetrafluoroethylene Resin, Nonrigid

MIL-S-22473	-	Sealing, Locking and Retaining Compounds (Single Component)
MIL-C-22520	-	Crimping Tools, Terminal, Hand or Power Actuated, Wire Termination, and Tool Kits General Specification for
MIL-W-22759/1	-	Wire, Electric, Fluoropolymer Insulated, TFE and TFE-Coated Glass, Silver-Coated Copper Conductor, 600
MIL-W-22759/2	-	Wire, Electric, Fluoropolymer Insulated, TFE and TFE-Coated Glass, Nickel-Coated Copper Conductor, 600 Volt
MIL-I-23053	-	Insulation Sleeving, Electrical, Heat Shrinkable, General Specification for
MIL-C-23190	-	Straps, Clamps, and Mounting Hardware, Plastic and Metal for Cable Harness Tying and Support
MIL-C-26482	-	Connectors, Electrical (Circular, Miniature, Quick Disconnect, Environment Resisting), Receptacles and Plugs, General Specification for
MIL-C-26500	-	Connectors, General Purpose, Electrical, Miniature, Circular, Environment Resisting, General Specification for
MIL-C-27500	-	Cable, Power, Electrical, and Cable, Special Purpose, Electrical, Shielded and Unshielded, General Specification for
MIL-C-38999	-	Connectors, Electrical, Circular, Miniature, High Density, Quick Disconnect (Bayonet, Threaded and Breech Coupling), Environment Resistant, Removable Crimp and Hermetic Solder Contacts, General Specification for
MIL-C-39012	-	Connectors, Coaxial, Radio Frequency, General Specification for
MIL-T-43435	-	Tape, Lacing and Tying
MIL-S-45743	-	Soldering, Manual Type, High Reliability, Electrical and Electronic Equipment
MIL-E-45782	-	Electrical Wiring, Procedures for
MIL-R-46846	-	Rubber, Synthetic, Heat-Shrinkable
MIL-C-55442	-	Cable Assemblies and Cord Assemblies, Packaging of
MIL-W-81044	-	Wire, Electric, Crosslinked Polyalkene, Crosslinked Alkane - Imide Polymer of Polyarylene Insulated, Copper or Copper Alloy

MIL-W-81381	-	Wire, Electric, Polyimide - Insulated Copper or Copper Alloy
MIL-C-81511	-	Connectors, Electrical, Circular, High Density, Quick Disconnect, Environment Resisting; and Accessories, General Specification for

STANDARDS

FEDERAL

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

MILITARY

MIL-STD-129	-	Marking for Shipment and Storage
MIL-STD-130	-	Identification Marking of U.S. Military Property
MIL-STD-202	-	Test Methods for Electronic and Electrical Component Parts
MIL-STD-454	-	Standard General Requirements for Electronic Equipment
MIL-STD-461	-	Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference
MIL-STD-785	-	Reliability Program for Systems and Equipment Development and Production
MIL-STD-810	-	Environmental Test Methods and Engineering Guidelines
MIL-STD-45662	-	Calibration System Requirements
MS 3420	-	Adapter, Cable Clamp to Cable, Bushing, Telescoping
MS 90387	-	Tool, Hand Adjustable for Plastic and Metal Tiedown Straps

(Unless otherwise indicated, copies of the federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Ave., Philadelphia, PA 19111-5094.

2.2 Non-Government publications. The following document(s) form 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 SOCIETY FOR TESTING AND MATERIALS

ASTM D 1149	-	Standard Test Method for Rubber Deterioration - Surface Ozone Cracking in a Chamber
ASTM D 1457	-	Standard Specification for Polytetrafluoroethylene (PTFE) Molding and Extrusion Materials

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

AEROSPACE INDUSTRIES ASSOCIATION OF AMERICA, INC. (NATIONAL AEROSPACE STANDARDS)

NAS 703	-	Wire, Electrical, Insulated, Copper, High Temperate, Hook-up and General Purpose (for 200°C Service)

(Application for copies should be addressed to the Aerospace Industries Association of America, Inc., 1250 Eye Street NW, Washington, DC 20005.)

SOCIETY OF AUTOMOTIVE ENGINEERS (AERONAUTICAL MATERIAL SPECIFICATIONS)

AMS 3623	-	Elastomeric Tubing, Electrical Insulation, Irradiated Polychloroprene, Flexible, Heat-Shrinkable, 1.750 to 1 Shrink Ratio
AMS 3632	-	Plastic Tubing, Electrical Insulation, Irradiated Polyvinylidene Fluoride, Semi-Rigid, Heat-Shrinkable, 2 to 1 Shrink Ratio
AMS 3636	-	Plastic Tubing, Electrical Insulation, Irradiated Polyolefin, Pigmented, Flexible, Heat-Shrinkable, 2 to 1 Shrink Ratio
AMS 3638	-	Plastic Tubing, Electrical Insulation
AMS 3815	-	Braid, Flat, Nylon, Electrical, Tying, Synthetic Rubber Coated

(Application for copies should be addressed to the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for related associated detail specifications, specification sheets, or MS standards), 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 First article. When specified (see 6.2), a sample of cable and harness assemblies shall be subjected to first article inspection (see 6.3) in accordance with 4.3.

3.2 Materials and parts. Materials and parts shall conform to the applicable drawings (see 6.4.8) and specifications referenced thereon, or shall be as specified herein. In the event of conflict, the detail drawing shall govern.

3.2.1 Metals. Metals shall be nonmagnetic and corrosion resistant alloys. Dissimilar metals, as defined in MIL-STD-454, Requirement 16, shall not be used in combination unless they are suitably coated to prevent electrolytic corrosion.

3.2.2 Non-metals. Thermoplastics and elastomers used as jacketing or harness protection materials shall be non-corrosive to copper and shall be flame retardant or non-burning.

3.2.3 Solder. Soldering process materials and requirements shall be in accordance with MIL-S-45743, unless otherwise specified on engineering drawings or by the procuring activity.

3.2.4 Insulated conductors. Unless other specified, insulated conductors (see 6.4.4) shall conform to MIL-W-5086, MIL-W-22759/1, MIL-W-22759/2, MIL-W-16878, MIL-W-81044, MIL-W-81381, or NAS 703.

3.2.4.1 Coaxial cable. Coaxial cable shall conform to MIL-C-17.

3.2.5 Fillers. At the option of the manufacturer, fillers may be used to make cable components round. Fillers may be spare wires; polyethylene, polytetrafluoroethylene rods or strands, or plastic molding. The polyethylene material shall conform to the requirements of MIL-P-21922, type II, grade 4, natural. The plastic molding shall conform to the requirements of ASTM D 1457. Oriented polypropylene multi-monofilament filler may be used upon approval of the procuring activity.

3.2.6 Connectors. Connectors shall be in accordance with MIL-C-5015, MIL-C-10544, MIL-C-26482, MIL-C-26500, MIL-C-38999, MIL-C-81511, or as specified

on the applicable drawing. Coaxial connectors shall be in accordance with MIL-C-39012.

3.2.6.1 Soldered terminations. Conductors shall be soldered to the connectors in accordance with MIL-S-45743.

3.2.6.2 Crimp contacts. Contacts shall be crimped with a tool in accordance with MIL-C-22520 or MIL-E-45782, as applicable.

3.2.6.3 Thread lubrication. Unless otherwise specified, antiseize compound conforming to TT-S-1732 shall be applied to the coupling ring threads of connectors which utilize threaded couplings.

3.2.6.4 Thread sealant. When thread sealant is required to seal threads joining connectors to adapters, the sealant shall be MIL-S-22473 Grade AA using surface primer Grade II.

3.2.6.5 Connector protection. Wires exiting from connectors shall be strain relieved. Entry of foreign material into wire contact interstices shall be prevented by grommet seals or by strain relief boots conforming to MIL-R-46846 or as specified on the applicable detail drawing.

3.2.7 Termination protection. Terminations shall be suitably protected to withstand the environment to which they will be subjected. If environmental end caps are not provided for connectors, plastic caps should be on the connectors at all times when tests are not being conducted.

3.2.8 Cord and tape. Unless otherwise specified by the detail drawing the following shall apply: Cord used for tying and lacing shall conform to the requirements of MIL-T-713. Lacing tape (see 6.4.10) shall conform to the requirements of MIL-T-43435 or AMS 3815. Wrapping tape shall conform to the requirements of MIL-I-631, type G form Tf, class 1.

3.2.9 Straps. Cable straps shall be in accordance with MIL-S-23190, associated Military Standard, or as specified on the applicable drawing.

3.2.10 Tools. Tools to install cable straps shall be in accordance with MIL-S-23190, MS 90387, or shall be in accordance with the strap manufacturer's specifications subject to approval by the procuring activity.

3.3 Design and construction. The design and construction of the cable or harness assemblies shall be in accordance with the detail drawings and this specification. In case of conflict between this specification and the detail specification or drawing, the detail specification or drawing shall govern.

3.3.1 Lacing. Lacing shall be continuous only where harness assemblies pass very near to moving or vibrating equipment and may be optional on panels or in junction boxes. Where no break-outs occur, ties shall be spaced approximately the diameter of the harness except that, for harnesses less than 0.5 inch in diameter, the ties shall be spaced not greater than .5 inch apart. Each breakout shall be separated form adjacent break-outs by at least one tie. Lacing knots shall be of the self-locking type and shall not open when tension is removed from the cord on either side of the knot. The lacing shall be tight enough to prevent slipping but shall not damage the lead insulation. Wires making up the harness assembly that are under the sleeving or conduit shall not be spot tied or laced. Two or more leads terminating at the same run number shall not be separated by ties. Start and finish ties and knots shall be adequately secured to prevent unraveling. Acceptable lacing procedures are specified in MIL-E-45782.

3.3.1.1 Harness straps. As an alternate method, cable or harness straps may be used, if approved, in lieu of lacing. Plastic or polyamide straps of an approved source may be used on harness or wire bundles. The straps shall be mounted snugly on the assembly conductors and be capable of being locked to prevent loosening or opening. These straps shall be positioned to correspond with the stiching interval specified in MIL-E-45782 or as specified on the applicable drawing. Procedures for installation of harness or cable shall be in accordance with instructions of the strap manufacturer subject to approval of the procuring activity.

3.3.2 Tubing or sleeving. Tubing or sleeving shall be cut square, stepped, slit or split in accordance with the applicable drawing. All tubing or sleeving shall be terminated within 0.125 inch of the sleeving symbol shown on the drawing and shall be secured to the cable and harness assembly as specified thereon (see 3.6).

3.3.3 Shielding. Shielding shall be in accordance with MIL-C-13777, MIL-W-16878, MIL-C-27500, or as specified on the applicable drawing. Braid conforming to QQ-B-575 shall be applied only when specified on the applicable detail drawing.

3.3.4 Lead connections. Solder connections shall be prepared and soldered in accordance with MIL-S-45743.

3.3.5 Construction tolerances. Unless otherwise specified on the drawing, the following shall apply:

3.3.5.1 Break-outs (see 6.4.1, 6.4.2). Break-outs shall be within 0.125 inch of the break-out point shown on the applicable drawing.

3.3.5.2 Break-out lengths. Break-out lengths shall have a tolerance of + 0.250, - 0 inch between break-out point and cut-off point.

3.3.5.3 Ground ferrules. The location of the ground ferrules shall be within ± 0.250 inch of the ferrule symbol location.

3.3.5.4 Band markers. Unless otherwise specified, the tolerance on band marker locations shall be ± 0.250 inch.

3.3.6 Cable or harness build-up and support. When cables or harnesses are required to be installed in accordance with this specification, the requirements of 3.3.6 through 3.3.6.3. shall apply. Cables, harnesses or individual wires shall be supported by clamps as specified on the drawing. For protection of insulated wires from abrasion in the connector clamp and for build-up of the wire to the required diameter, where the number of wires terminating in a clamp connector are insufficient to allow the clamp to grip the wires properly, apply synthetic rubber stripping around the wires under the cable clamp. The build-up material shall be synthetic rubber, type S, class SA or SB, durometer hardness 50 ± 5 in accordance with MIL-R-3065. Soft telescoping bushings in accordance with MS 3420 or heat shrinkable tubing in accordance with MIL-I-23053 (except PVC types, slash 2 and 3), AMS 3623, or AMS 3636 may be used for protection under cable clamps.

3.3.6.1 Clamp size. Clamps shall be of sufficient size to hold the cable or harness securely without damaging insulation. When required, build-up material may be installed around the cable or harness to increase thickness so that the clamp will make a tight connection.

3.3.6.2 Clamp location. Clamps shall be located to prevent damage to the cable or harness by vibration, chafing, abrasion, and flexing, or from sharp edges and points. Clamps shall be used to prevent cable or harness from shorting across exposed parts, interfering with other equipment or causing strain on splices, terminals, and connectors.

3.3.6.3 Clamp attaching parts. Clamps shall be attached separately with screws or bolts of the shortest length that will allow at least 1.5 threads past the nut or joining part; or if impractical, screws should have 1.5 diameter thread engagement. All threaded parts shall be made vibration proof by lockwashers, locknuts, retention varnish, or other means. Protruding clamp screws that could interfere with or damage a cable or harness shall be capped with a nylon dome nut or similar protective device.

3.3.6.4 Heat shrinkable strain relief boots. Heat shrinkable strain relief boots should be used instead of clamps when chafing of wires is possible or when environmental protection or strain relief of connector backshells or contacts is required.

3.3.7 Cables.

3.3.7.1 Component twisting. Twisting components, such as twisted pairs and twisted triads, shall be layed-up in such a manner that no residual torsional stress exists around the axes of any individual wire. The length of lay shall be as follows:

(a) Length of lay for pairs shall be eleven times the diameter of the largest wire in the twisted component.

(b) Length of lay for triads shall be fourteen times the diameter of the largest wire in the twisted component.

(c) Tolerance on length of lay shall be $\pm$ 33.3 percent of the values specified in (a) and (b).

3.3.7.2 Final cabling - Types I, II and IV. Final cabling shall be effected in such a manner that no residual torsional stress exists around the axis of any component or individual wire. The layers shall be wound uni-lay (see 6.4.12) unless contra-helically (see 6.4.5) as specified on the drawing.

3.3.8 Harnesses - Type III. When harnesses are required to be constructed and installed in accordance with the specification, the requirements of 3.3.8.1 through 3.3.8.4 shall be employed.

3.3.8.1 Harness routing. Harnesses shall be routed in accordance with the applicable drawing. When the drawing does not provide sufficient information, harness routing shall follow the most direct path possible between points consistent with good dressing practices and good electronic procedures. Each single lead shall be routed unbroken and unspliced between its "from" and "to" points.

3.3.8.1.1 Routing safety and reliability precautions. The following routing safety and reliability precautions shall be observed:

(a) Harness shall be routed away from lines carrying flammable fluids or gases. When a clearance of less than two inches between such lines and harnesses exists, suitable clamps shall be used to provide and maintain a clearance of not less than 0.5 inch.

(b) Harness shall be routed away from all high temperature equipment and moving parts.

(c) Harness shall not pass under sharp parts or over sharp edges or points without suitable protection.

(d) Harness attached to assemblies where relative movement occurs shall be installed and protected to prevent damage form the movement, such as abrasion or excessive bending or twisting.

(e) Harness passing through a hole or partition shall be protected by use of a grommet or other suitable means.

(f) Harness shall be installed to twist (flex in torsion) rather than bend across hinges.

(g) When similar connectors are used in proximity, harness shall be routed to prevent incorrect connections.

(h) Shielded twisted pair leads must run as specified in 3.3.8.1. The shield shall go to the point indicated on the drawing. If no destination is shown, the shield shall be cut back and insulated as shown on the drawing.

(i) Shielded leads whose shields are not to be used as conductors shall have their shields trimmed back and secured at the point indicated on the drawing. Shielding shall be secured so as not to damage the insulation of any lead or short circuit to any exposed metal.

(j) Shielded leads whose shields are to be connected may use the shield itself for connection or may have a stranded lead connected to the shield by a suitable termination device.

3.3.8.2 Harness length. Harness length shall be sufficient for the distance required without excess slack. Leads at connectors or termination shall be of sufficient length to permit a service loop for restripping and reconnecting operations if the service loop does not prevent the assemblies from meeting shock and vibration requirements of 3.5.3 and 3.5.4. Service loops shall be not less than 0.750 inch minimum unless otherwise specified on the drawing.

3.3.8.3 Harness bends and curves. Sharp bends and curves shall be avoided in harness routing. The following bend radii shall be used:

(a) Power wire and cable bend radii shall be at least ten times the outside diameter of the harness.

(b) At terminals, or where suitably supported, the minimum bend radius may be reduced to three times the outside diameter of the harness.

(c) If required, the harness may be enclosed in insulating sleeving and a minimum bend radius of twice the outside diameter of the harness used.

(d) Unless otherwise specified, the minimum bend radius for coaxial cables shall be ten times the outside diameter and the bend shall not affect the operating characteristics of the cable.

(e) Bend radii formed from straight sections of harness shall be at least five times the outside diameter of the harness.

(f) Coaxial cable with soft dielectric and hookup wire with soft dielectric, such as silicone rubber, shall not be laced.

3.3.8.4 Harness accessibility. Wherever possible, the harness shall be routed to provide easy access to parts requiring routine or frequent maintenance or adjustment.

3.3.9 Wires terminated in connectors.

3.3.9.1 Wire cross-overs. Wires should be dressed at least four inches from the connector in such a manner that there will be no crossovers of single conductor wires within four inches of the connector. Conductors emerging from a common jacket (multiconductor) may cross other wires if the conductors are not terminated in adjacent pins.

3.3.9.2 Ties. Wires terminated in connectors shall have the first tie, if required, as close as possible to the rear of the connector, but shall be so located that tied wires do not place a strain on the seal of resilient seal connectors or on the wire where it enters the connector assembly.

3.3.9.3 Seals. For connectors with a grommet seal, the conductor shall enter the grommet seal perpendicular to the face of the seal. The conductor entry shall be considered perpendicular if the seal is not distorted to the extent that the inside of the connector is exposed.

3.3.9.4 Terminations. Wires terminated in connectors without grommet seals shall be protected by potting with material according to MIL-S-8516 or by tubing or sleeving according to MIL-I-23053 (except PVC types, slash 2 and 3), AMS 3632, AMS 3636, or AMS 3638 applied over each connection.

3.4 Performance and product characteristics.

3.4.1 Conductor continuity. Each conductor of cable or harness assemblies shall be electrically continuous between correct terminations as specified on the applicable drawing when tested as specified in 4.8.1.

3.4.2 Conductor resistance. The dc resistance of each conductor of cable or harness assemblies shall be specified in the basic wire or cable specification when tested as specified in 4.8.2.

3.4.3 High voltage capability. Unless otherwise specified on detail drawings, each insulated conductor of cable or harness assemblies shall be capable of

withstanding the application of 1,000 volts root mean square (rms), 60 Hertz (Hz) when tested as specified in 4.8.3. Leakage current shall be not more than 0.5 milliampere (ma) per wire tested. Also, but not simultaneously, a test potential of 500 volts rms shall be applied between shields if the shields are insulated from each other by overlaid insulation of interharness insulation and not electrically connected.

3.4.4 Insulation resistance. When tested, the insulation resistance of the cable and harness assemblies shall be not less than the values specified in 4.8.4.

3.4.5 Jackets.

3.4.5.1 Cable assembly jackets. When a jacket is required by the drawing, but not otherwise specified as to type, cable assembly jackets shall be in accordance with the requirements of MIL-R-6855, or MIL-I-23053 (except PVC types, slash 2 and 3), MIL-R-46846, AMS 3623, or AMS 3636, as applicable.

3.4.5.2 Harness assembly jackets. When a jacket is required by the drawing, but not otherwise specified as to type, harness assembly jackets shall be in accordance with the requirements of MIL-I-22076, MIL-I-22129, MIL-I-23053 (except PVC types, slash 2 and 3) or MIL-R-6855, MIL-R-46846, ASM 3623 or AMS 3636, as applicable.

3.4.6 Special characteristics. Test for special characteristics such as coaxial cables or any conductors of cable or harness assemblies terminated on an electronic component shall be limited to those characteristics specified in the specification or drawing for the specific cable or harness assembly.

3.4.7 Type IV assemblies. The specific requirements of type IV assemblies shall be in accordance with the applicable drawings or equipment/item specification. The applicable requirements of MIL-STD-461 shall apply.

3.4.7.1 Reliability requirements. Type IV missile cable assemblies shall have a Reliability and Confidence Level in accordance with the applicable item specification or detail drawing. The applicable requirements of MIL-STD-785 shall apply.

3.5 Environmental. The following environmental requirements shall be met unless otherwise specified in engineering drawings or by the procuring activity.

3.5.1 Low temperature. The cable or harness assemblies shall be capable of withstanding a low temperature of -62° $\pm$ 3° Celsius (C) for not less than 72 hours. Upon completion of the 72-hour exposure, the assemblies shall be allowed to stabilize at ambient room temperature hereinafter specified as 25° $\pm$ 3° C. The cable or harness assemblies shall then meet the requirements for insulation resistance (3.4.4).

3.5.2 High temperature. The cable or harness assemblies shall be capable of withstanding a high temperature of 90° ± 1° C for not less than 48 hours. Upon completion of the 48-hour exposure, the assemblies shall be allowed to stabilize at ambient room temperature and shall then meet the requirements for insulation resistance (see 3.4.4).

3.5.3 Vibration. The assemblies shall be capable of withstanding vibration for 30 minutes in each of three mutually perpendicular axes nonconcurrently in a frequency range from 10 to 2,000 Hz at 0.10-inch double amplitude from 10 to 55 Hz, and 20 times the acceleration due to gravity (g) from 55 to 2,000 Hz without damage or deterioration of performance.

3.5.4 Shock. The assemblies shall be capable of withstanding a transient decelerating force of 50 g for 11 ± 1 milliseconds without damage or deterioration of performance.

3.5.5 Thermal shock. The assemblies shall be capable of withstanding the rate of change in ambient temperature as specified in 4.9.5 and as follows: From 71° ± 1° C to -62° ± 1° C to 25° ± 3° C without damage or deterioration of performance.

3.5.6 Humidity (temperature cycling). The assemblies shall be capable of withstanding a relative humidity of 95 percent, while temperatures are cycled from 71° to 27° C for 5 cycles, without damage or deterioration of performance. Assemblies shall be suitably protected at the connector ends to maintain electrical integrity of assemblies during test.

3.5.7 Fungus. The assemblies shall be capable of withstanding fungus growth as encountered in tropical climates without damage or deterioration of performance. Assemblies shall be suitably protected at connector ends to maintain electrical integrity of assemblies during test.

3.5.8 Salt spray. The assemblies shall be capable of withstanding exposure to a 20 percent salt solution for 50 hours. The exposure shall not cause corrosion of the basic metal, nor cause any deterioration of performance of the assembly. Assemblies shall be suitably protected at the connector ends to maintain electrical integrity of assemblies during test.

3.5.9 Altitude. Cable and harness assemblies shall be capable of operation to the applicable altitude specified below:

Type I and II	-	10,000 feet
Type III	-	150,000 feet
Type IV	-	80,000 feet (except umbilical types shall be 10,000 feet)

Leakage current shall be greater than 0.5 ma at maximum altitude.

3.5.10 Wind and rain. The assemblies shall be capable of meeting the requirements for high voltage capability (see 3.4.3) after being subjected to the wind and rain tests specified in 4.9.10. Assemblies shall be suitably protected at the connector ends to maintain electrical integrity of assemblies during test.

3.5.11 Ozone resistance, type II assemblies. The assemblies shall be capable of withstanding the ozone resistance test specified in 4.9.11. The cable sheath shall exhibit no visible cracks or deterioration when examined under a glass having a 3 power magnification.

3.5.12 Impact. When specified (see 6.2), type I and type II assemblies shall be capable of withstanding the impact tests of MIL-C-13777 without incurring a change in insulation resistance between wires or change in wire resistance, impairment of binding capabilities, or broken strands.

3.5.13 Cold bend. When specified (see 6.2), type I and type II assemblies shall be capable of withstanding the cold bend test specified in 4.9.13 without damage or deterioration of performance.

3.5.14 Abrasion resistance. The assemblies shall be capable of withstanding abrasion on a machine as specified in FED-STD-228, Method 2211, to the following limits:

Type I and IV	-	45 inches of tape, weight support bracket "C" 4.25-pound weight.
Type II	-	90 inches of tape, weight support bracket "C" 10.0-pound weight.

3.3.15 Potting or molding material. When required, potting or molding material shall be in accordance with the detail specification or detail drawing.

3.6 Dimensions. Dimensions shall be as specified on the applicable drawing or to scale and shall apply only when a harness is on the jig fixture.

3.7 Weight. Weight shall be as specified on the applicable drawing.

3.8 Finish. All surfaces shall be clean and free from harmful and extraneous materials.

3.9 Product marking. Interior packages and exterior containers shall be marked in accordance with MIL-STD-129. Marking for identification shall be in accordance with MIL-STD-130. Unless otherwise specified on the detail drawing and

when required by the drawing or procuring activity (see 6.2), one of the following methods shall be used to identify assemblies:

(a) Plastic bands

(b) Performed metal bands formed on cable

(c) Hot-impression stamping

(d) Ink marking (lacquer-coated)

(e) Vulcanized synthetic rubber

(f) Identification sleeving, hot-impression stamped

(g) Marking applied by silk screen process.

3.10 Workmanship. Uniformity of shapes, dimensions, and performance shall permit interchangeability of assemblies of the same type and design. There shall be no protrusions, sharp edges, dents, cracks, bends, breaks, chips, loose solder connections, broken strands, discontinuity of shielding or jacket, or any other defect that would render the assembly unsuitable for the purpose intended.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may sue 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 this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

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

a. First article inspection (see 4.3).

b. Quality conformance inspection (see 4.4)

4.3 First article inspection. The first article sample shall be subjected to all examinations and tests specified herein. First article examinations and testing shall be performed by the contractor under Government observation at a site specified by the contracting officer (see 6.2). Unless otherwise specified by the procuring activity, the first article sample shall consist of five assemblies of one type made by the same methods proposed to be used in subsequent production. Unless otherwise specified, the environmental tests shown in table I shall be performed on the first article sample only:

TABLE I. First Article Inspections.

Inspection	Requirement paragraph	Test paragraph
Low temperature	3.5.1	4.9.1
High temperature	3.5.2	4.9.2
Vibration	3.5.3	4.9.3
Shock	3.5.4	4.9.4
Thermal Shock	3.5.5	4.9.5
Humidity	3.5.6	4.9.6
Fungus	3.5.7	4.9.7
Salt spray	3.5.8	4.9.8
Altitude	3.5.9	4.9.9
Wind and rain	3.5.10	4.9.10
Ozone resistance	3.5.11	4.9.11
Impact	3.5.12	4.9.12
Cold bend	3.5.13	4.9.13
Abrasion resistance	3.5.14	4.9.14
Reliability (type IV assemblies)	3.4.7	4.8.7

4.4 Quality conformance inspection. Quality conformance inspections shall be as specified table II. Sampling for quality conformance shall be in accordance with table III.

TABLE II Quality conformance inspection.

Inspection	Requirement paragraph	Test paragraph
Conductor continuity	3.4.1	4.8.1
Conductor resistance	3.4.2	4.8.2
High Voltage capability	3.4.3	4.8.3
Insulation resistance	3.4.4	4.8.4
Jackets	3.4.5	4.8.5
Special characteristics	3.4.6	4.8.6

4.5 Inspection provisions.

4.5.1 Lot formation. An inspection lot shall consist of a group of like items produced at the same place utilizing the same batches of materials, lots of components, process runs, fabrication techniques, assembly techniques, tools, equipment and facilities, but shall not be greater than one month's production.

4.5.2 Performance inspections.

4.5.2.1 For inspection. Unless otherwise specified (see 6.2), sampling for inspection shall be in accordance with table III, and the classification of defects specified in table IV. Inspection for critical defects (and major defects, when specified) shall be 100%. Any failure shall be cause to reject the entire lot.

TABLE III Sampling plan.

Lot size	Sample size
2 to 13	100%
14 to 150	13
151 to 280	20
281 to 500	29
501 to 1200	34
1201 to 3200	42
3201 to 10,000	50
10,001 to 35,000	60
35,001 to 150,000	74
150,001 to 500,000	90
500,001 and over	102
In all cases: Acceptance is ZERO. Rejection number is ONE.	

TABLE IV Classification of defects.

Categories	Defects	Inspection method
Major		(Table III Sampling Plan)
101	Break-out lengths incorrect	Measure
102	Damaged tubing sleeving, connector pins	Visual
103	Damaged Insulation	Visual
104	Damaged connector	Visual
105	Damaged conductor	Visual
106	Location of break-outs incorrect	Measure
107	Incorrect identification	Visual
108	Incorrect marking	Visual
109	Improper wire	Visual
110	Improper type cable	Visual
111	Improper color coding (conductor)	Visual
112	Improper items	Visual
113	Improper packaging	Visual
114	Improper quantity	Count
115	Improper destination	Visual
116	Improper tinning and soldering	Visual
117	Improper stripping and shield dressing	Visual
118	Excessive solder	Visual
119	Excessive heat during soldering	Visual
120	Insufficient solder	Visual
121	Cold solder	Visual
122	Wrong type or grade solder	Visual
123	Missing or illegible identification marking	Visual
124	Missing or improper tubing sleeving,connector pins	Visual
125	Foreign materials (potential short)	Visual
126	Overall dimensions incorrect	Measure
127	Weight not as specified	Measure
128	Wrong connectors	Visual
129	Length, minimum, incorrect	Measure
130	Illegible marking	Visual
131	Bend radius of cable or harness too small	Measure
132	Packaging inconsistent with data sheet	Visual
133	Poor workmanship	Visual

4.6 Other examinations. The cable and harness assemblies shall be examined to determine conformance to 3.2, 3.3, 3.6, 3.7, 3.8, 3.9 and 3.10.

4.7 Test equipment and inspection facilities. Test equipment and inspection facilities shall be of sufficient accuracy, quality, and quantity to permit performance of the required inspection. The contractor shall establish calibration of inspection equipment to the satisfaction of the Government. Calibration of the standards which control the accuracy of the inspection equipment shall comply with the requirements of MIL-STD-45662.

4.8 Test procedures.

4.8.1 Conductor continuity. To determine conformance to 3.4.1, each assembly shall be tested for conductor continuity with a suitable low voltage device such as an ohmmeter.

4.8.2 Conductor resistance. To determine conformance to 3.4.2, each assembly shall be tested for conductor resistance in accordance with the applicable basic wire or cable specification.. A maximum of 1.04 times the specified maximum of the individual conductor shall be allowed.

4.8.3 High voltage capability. To determine conformance to 3.4.3, each insulated conductor of cable or harness assemblies shall be subject to an application of 1,000 volts rms, 60 Hz, for not less than one minute. If the conductor is shielded, the voltage shall be impressed between the inner conductor and the shield. Also, but not simultaneously, a test potential of 500 volts rms shall be applied between shields if the shields are not electrically connected. An appropriate current measuring device capable of indicating leakage currents of 0.5 ma shall be used for performing the test.

4.8.4 Insulation resistance. To determine conformance to 3.4.4, the insulation resistance between one conductor and all other conductors, including shields, shall be measured and shall be not less than the value specified in table V, except that if all shields are tested against all other conductors the insulation resistance shall be not less than 25 megohms. The potential for this test shall be 500 volts $\pm$ 50 volts direct current (dc) and shall be applied for such a time that all line transients have died out and the circuit has reached a steady-state condition. This time shall be not less than one second. This requirement is not applicable to those conductors on type II harness assemblies that are terminated on an electronic component.

TABLE V. Insulation resistance.

Cable length	Resistance value
Not exceeding 100 feet	100 megohms
Between 100 and 300 feet	75 megohms
Over 300 feet	50 megohms

4.8.5 Jackets. To determine conformance to 3.4.5, cable jacketing shall be tested for thickness as specified in FED-STD-228, methods 1013 or 1014, as applicable.

4.8.6 Special characteristics. To determine conformance 3.4.6, the procedure for any special test (impedance, voltage standing wave ratio, attenuation, etc.) shall be evolved by the contractor and approved by the contracting officer.

4.8.7 Type IV reliability testing. Reliability testing for type IV assemblies shall verify that the required reliability and confidence level has been met in accordance with the requirements of the applicable detail specification or drawing.

4.9 Environmental. The following environmental test methods shall be conducted unless otherwise specified in engineering drawings and supporting documentation.

4.9.1 Low temperature. To determine conformance 3.5.1, the cable or harness assemblies shall be placed in a temperature chamber and subjected to a temperature -62° ± 3° C for not less than 72 hours. Upon completion of the 72-hour exposure, the assemblies shall be allowed to stabilize at normal room temperature and then shall be tested for insulation resistance as specified in 4.8.4.

4.9.2 High temperature. To determine conformance to 3.5.2, the cable or harness assemblies shall be placed in a temperature chamber and subject to a temperature of +93° ± 1° C for not less than 48 hours. Upon completion of the 48-hour exposure period, the assemblies shall be allowed to stabilize to ambient room temperature. The assemblies shall then be tested for insulation resistance as specified in 4.8.4.

4.9.3 Vibration. To determine conformance to 3.5.3, the cable or harness assemblies shall be fastened to a vibration table with the connectors and clamping method simulating missile mounting and routing within practical limits. The assemblies shall be vibrated in three mutually perpendicular axes within a frequency range of 10 to 2,000 to 10 Hz. The amplitude shall be 0.1 inch double amplitude from 10 to 55 Hz. The acceleration level shall be 20-g peak from 55 to 2,000 Hz. The assemblies shall be vibrated for 30 minutes in each axis. The frequency range between 20 and 2,000 Hz shall be scanned in 15 minutes for openings and resistance change during the vibration. Any resonant frequencies shall be noted. Approved instruments capable of detecting an open circuit of more than 10 microseconds duration shall be used. At the completion of the vibration test, the assemblies shall then be tested for insulation resistance as specified in 4.8.4.

4.9.4 Shock. To determine conformance to 3.5.4, the cable or harness assemblies shall be fastened to the shock table with the connectors and clamping

method simulating missile mounting and routing within practical limits. The assemblies shall be dropped in each of three mutually perpendicular planes with a transient decelerating force of 50-g peak for a duration of 11 ± 1 millisecond as measured along the time base. During the test, a representative number of circuits shall be monitored for openings and resistance change. Approved instruments capable of detecting an open circuit of more than 10 microseconds duration shall be used. The total number of drops shall be six with two drops in each of three mutually perpendicular planes. At the completion of the shock test, the assemblies shall then be tested for insulation resistance as specified in 4.8.4

4.9.5 Thermal shock. To determine conformance to 3.5.5, the cable or harness assemblies shall be subjected to five cycles of temperature change as indicated below. The assemblies shall be maintained at the specified temperature for not less than 30 minutes and transferred from one temperature to another in not greater than one minute. The assemblies shall be kept on a tray during the test.

(a) Step 1: 71° ± 1° C

(b) Step 2: -62° ± 1° C

(c) Step 3: 25° ± 3° C

Within 45 minutes after the test, the assemblies shall then be tested for insulation resistance as specified in 4.8.4.

4.9.6 Humidity (temperature cycling). To determine conformance to 3.5.6, the cable or harness assemblies shall be supplied with mating receptacles to insure an environmental end-seal and placed in a humidity chamber at ambient room temperature. The chamber temperature shall be raised uniformly to 71° ± 3° C during a 2-hour period maintaining 95 percent relative humidity. These conditions shall be maintained for not less than 6 hours. During the next 16-hour period, the temperature of the chamber shall drop at a uniform rate to 27° ± 1° C. This shall constitute one cycle and the assemblies shall be subjected to five complete cycles. The assemblies shall then be tested for insulation resistance as specified in 4.8.4.

4.9.7 Fungus. To determine conformance to 3.5.7, the cable or harness shall be tested in accordance with the fungus test of MIL-STD-810, Method 508.4. The assemblies shall then be tested for insulation resistance as specified in 4.8.4.

4.9.8 Salt spray. To determine conformance to 3.5.8, the cable or harness assemblies shall be supplied with mating receptacles to insure an environmental end-seal and subjected to a salt spray test of 50 hours in accordance with MIL-STD-202, method 101, condition B. A 20 percent salt solution shall be used. Immediately after, the assemblies shall be washed with tap water, and dried for 1 hour in a circulating air

oven at a temperature of 38° ± 3° C. The assemblies shall then be tested for insulation resistance as specified in 4.8.4.

4.9.9 Altitude. To determine conformance to 3.5.9, the cable or harness assemblies shall be placed in an altitude chamber in a dry condition after having been conditioned at a temperature of 25° ± 3° C and a relative humidity below 20 percent for not less than 6 hours. The assemblies shall be provided with mating receptacles and the circuits brought out to a high potential tester. Type I and type II assemblies shall then be subjected to a simulated altitude of 10,000 feet. Type III assemblies shall be subjected to a simulated altitude of 150,000 feet. Type IV (except umbilical) assemblies shall be subjected to a simulated altitude of 80,000 feet. Umbilical assemblies shall be subjected to a simulated altitude of 10,000 feet. The assemblies shall then be tested for high-voltage capabilities as specified in 4.8.3, except that the test potential shall be 450 volts rms.

4.9.10 Wind and rain. To determine conformance to 3.5.10 type II and type IV (umbilical only) cable assemblies, with all connectors engaged, shall be placed in a chamber and subjected to a simulated rain for not less than 2 hours in accordance with the requirements of MIL-STD-810, Method 506.3. At the conclusion of the 2-hour period the assemblies shall then be tested for high-voltage capability as specified in 4.8.3. The assemblies shall be subjected to a reduced rainfall of 1 ± 0.250 inch per hour for an additional period of 8 hours during which time a simulated wind of 15-25 miles per hour shall be applied from each of 4 directions for not less than 2 hours in each direction. The assemblies shall again be tested for high-voltage capability as specified in 4.8.3.

4.9.11 Ozone resistance, Type II assemblies. To determine conformance to 3.5.11, type II cable assemblies shall be tested for ozone resistance in accordance with ASTM D 1149 except ozone concentration shall be 50 parts per 100,000,000. There shall be not less than 4.5 cubic feet per minute of air circulating through the chamber and the chamber temperature shall be 38° C. After removal from the chamber, the cable specimen shall be bent sharply through an angle of 90 degrees in each of 4 mutually perpendicular planes at 4 equidistant locations spaced over the length of the specimen. While in the bent position, the cable shall be examined for cracks as specified.

4.9.12 Impact, type I and II assemblies. To determine conformance to 3.5.12, cable preparation, electrical connections, and impact test shall be in accordance with MIL-C-13777. Upon completion of the test, the assemblies shall be tested for insulation resistance as specified in 4.8.4.

Type I - The assemblies shall be subjected to 50 impacts at a rate of 15 per minute. The weight of the anvil shall be based on 1.0 pound per 0.100 inch of cable or harness up to a maximum weight of 27.5 pounds.

Type II - The assemblies shall be subjected to 200 impacts at a rate of 15 per minute. The weight of the anvil shall be as specified for type I assemblies.

4.9.13 Cold bend. To determine conformance to 3.5.13, type I and type II cable assemblies shall be subjected to the cold bend test specified in MIL-C-13777. At the completion of the cold bend test, the assemblies shall then be tested for high-voltage as specified in 4.8.3.

4.9.14 Abrasion resistance. To determine conformance to 3.5.14, the assemblies shall be tested using a machine as specified in FED-STD-228, Method 2211, weight support bracket and weight as specified in 3.5.14. The assemblies shall be subjected to the applicable test. Each reading shall be the length of abrasion tape, in inches, to have come in contact with the cable insulation when the machine stops. After each reading, the assemblies shall be moved forward 2 inches and rotated clockwise 90 degrees. Eight readings shall be obtained for each assembly. An average shall be obtained by calculating the arithmetic mean of all the readings. This average shall define the abrasion resistance of the assembly under test. All conductors of the assemblies shall be polarized during abrasion tests in order to detect insulation removal from any single conductor.

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

5. PACKAGING

5.1 Preservation, packaging, packing and marking. The cable and harness assemblies shall be cleaned, preserved, packaged, packed and marked in accordance with the requirements of MIL-C-55442 (6.2), and applicable detail requirements.

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 cables and harness assemblies described in this specification are intended for use in missiles and missile ground support equipment.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Title, number, and date of the specification

b. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1)

c. Type of assembly required (see 1.2)

d. Whether a first article is required (see 3.1)

e. Whether impact requirements are required (see 3.5.12)

f. Whether cold-bend requirements are required (see 3.5.13)

g. Installation where first article tests are to be performed (see 4.3)

h. Selection of applicable levels of preservation, packaging, and marking (see 5.1)

i. Identification requirements to be employed (see 3.9)

j. Material and process options to be employed, when options are authorized by the applicable requirement (see 3.2)

6.3 First article. When first article inspection is required, the contracting officer should provide specific guidance to offerors whether the item(s) should be a first article sample, a first production item, or a number of items to be tested as specified in 4.3. The contracting officer should also include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results and disposition of first articles. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract.

6.4 Definitions. For the purpose of this specification, the following definitions shall apply.

6.4.1 Break-out. One or more unlaced leads branching off a cable or harness assembly drawn to exact length.

6.4.2 Break-out point. The point on a cable or harness assembly where a break-out occurs.

6.4.3 Cable assembly. A cable assembly consists of two or more conductors with a concentric lay, assembled with connectors and having the protective cover or jacket integral with the other components.

6.4.4 Conductor. A complete electrical path furnished by a wire or wires and the terminations thereof.

6.4.5 Contra-helical lay. Each layer of the cable wound in opposite spiral directions.

6.4.6 Cut-off point. The point at which the break-out terminates.

6.4.7 "Damage or deterioration of performance". A requirement worded in this manner will be considered satisfied if the sample is within acceptable limits on all tests specified for the particular requirement.

6.4.8 Drawings. The cable and harness assembly drawings shall show the location and length of break-outs, type of lacing sleeving, and run numbers, etc. The drawings are drawn to full scale, the scales shall be shown in the top right hand corner and the bottom left corner of the drawing to provide checks for paper shrinkage in order that scaling of the drawing may be possible. When necessary, a correction factor may be used. Harness drawings shall show the contour within which the finished harness must fit.

6.4.9 Harness assembly. A harness assembly consists of two or more conductors, laced or jacketed together, with or without break-outs, and assembled with connectors. The harness assembly may include lugs, connectors, sleeving markers, or other attached parts as required by the detail drawing.

6.4.10 Lacing. An operation whereby a group of insulated leads are bound together to form a harness assembly.

6.4.11 Lead-run. A continuous path of insulated wires between two cut-off points and their respective run numbers.

6.4.12 Leg. Two or more leads branching out of the cable or harness assembly. These leads are laced or sleeved together.

6.4.13 Run number. A number locating a cut-off point, designating the start of finish of a lead-run, also the number of the break-out in sequence clock-wise around the contours of cable or harness assemblies.

6.4.14 Unilay. Each layer of the cable wound in the same spiral direction.

6.5 Metrication. Metric equivalents in accordance with FED-STD-376 are acceptable for use in this specification.

6.6 Subject term (keyword) listing.

Bundles, wiring
Lacing and tying
Umbilical
Wiring, electrical and electronic

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

Custodians:
Army - MI
Air Force - 70

Review activities:
Army - AR, CR, ER
Air Force - 19, 70, 71, 84

User activities:
Army - AT
Navy - MC

Preparing Activity:
Army - MI

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