SECTION 06 90 01

POTTED ARAMID FIBER MEMBERS
04/14

PART 1 GENERAL

1.1 DEFINITIONS

This specification covers requirements for tower guys droop cables, and antenna wire extensions comprising jacketed Aramid fiber rope, and potted end fittings with threaded connections. the term "member" is equivalent to the term "terminated cable assembly" used herein and both terms apply to items covered by this specification.

1.1.1 Aramid Fiber

A manufactured fiber in which the fiber-forming substance is a long-chain synthetic polyamide in which at least 85 percent of the amide (-CO-NH-) linkages are attached directly between two aromatic rings.

1.1.2 End Fitting

Mechanical device which is attached on each end to the termination fitting. the end fittings are not included in this specification.

1.1.3 Cable Assembly

The aramid fiber rope core and synthetic jacket covering the core.

1.1.4 Potted Cable Termination

The bundle of fibers that are individually encapsulated by a resin matrix (adhesive) at the terminal end of the lifeline, contained by a "pot". Together, the adhesive and fibers, form a composite structure. This composite end holds 100 percent of the cable's load that is imparted to the fitting terminations.

1.1.5 Proof Load

An axial tensile load, expressed in units of force, which the product must withstand without evidence of any damage or permanent set.

1.1.6 Terminated Cable Assembly

The lifeline cable assembly, termination fitting, and potted connection.

1.1.7 Turnbuckle

An end fitting that allows the assembly length to be adjusted to tension the assembly after connection to the anchorage. The turnbuckle is not included in this specification.

1.2 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only. Unless otherwise specified, the issues of these

documents are those cited in the solicitation or contract.

FEDERAL STANDARDS

FED-STD-H28	(1994) Screw-Thread Standards for Federal Services

CODE OF FEDERAL REGULATIONS

ASTM INTERNATIONAL (ASTM)

ASTM B117	(2011) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM B308/B308M	(2010) Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles
ASTM D1623	(2009) Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics
ASTM D2240	(2005; R 2010) Standard Test Method for Rubber Property - Durometer Hardness
ASTM D5963	Standard Test Method for Rubber Property - Abrasion Resistance (Rotary Drum Abrader)
ASTM G154	(2012a) Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-STD-167-1	Mechanical Vibrations of Shipboard Equipment (Type 1-Environmental and Type II-Internally Excited)Ref Title

Order of Precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

1.3 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Test results; G

Design; G

Assembly; G

Terminated cable assembly; G

Termination Fitting; G

PART 2 PRODUCTS

2.1 REQUIREMENTS

2.1.1 Conformance

A sample terminated cable assembly shall be subjected to conformance Test results inspection in accordance with 3.2.

2.1.2 Recycled, Recovered, or Environmentally Preferable Materials

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

2.1.3 Design

The assembly design should consist of a cable assembly, end fittings and potting.

2.1.4 Assembly

2.1.4.1 Terminated cable assembly

The cable assembly shall be connected to the termination fitting through the use of potted synthetic bonding material.

2.1.4.2 Termination Fitting

The potted cable Termination fitting shall be capable of withstanding the full breaking strength of the connected cable in accordance with FED-STD-H28.

2.1.4.3 Cable Assembly

The cable assembly shall be jacketed Aramid fiber rope. The cable assembly shall be of the thickness indicated on the drawings for each application.

2.1.4.4 Preparation for Potting.

The procedure to make the potted terminations on the rope shall be in accordance with the recommended procedures of the rope and termination suppliers.

2.2 MATERIALS

2.2.1 Termination fittings

End fittings shall be galvanized steel in accordance with ASTM B308/B308M.

The extruded jacket shall be a polyurethane elastomer selected for abrasion resistance and ultraviolet (UV) exposure.

2.3 POTTING MATERIAL

The potting material resins shall be selected for use what Aramid fiber

rope.

2.4 PHYSICAL CHARACTERISTICS

2.4.1 Appearance

Terminated cable assemblies shall be clean and free of defects that affect appearance, such as burrs, silvers, sharp edges, rough tool or grind marks, pitting, staining, blistering, flaking, peeling, or discoloration of the exposed surfaces. The jacket shall be thoroughly bonded to the substrate and free from blisters and air bubbles. Terminated cable assemblies shall be free of film, foreign matter embedded in the finish, a coated surface that has sags, runs, fractured, buckled, bent, punctured, or malformed parts. The potting shall have no cracks when examined after assembly testing in accordance with 3.6.7.2 The potting surface shall have to no more than four voids; and any voids shall be less than 1/8 inch long by 1/8 inch wide and shall be less than 1/16 inch deep. The cable jacket surface of the cable shall have a shore hardness Type A range of 85 to 90 and shall have a uniform color.

2.5 PERFORMANCE CHARACTERISTICS

2.5.1 Environmental Conditions

Terminated cable assemblies shall maintain strength at temperatures between -20 degrees F (-29 degrees C) and +140 degrees F(+50 degrees C).

2.5.2 Minimum Acceptance Strength

Terminated cable assemblies shall be capable of withstanding a tension as noted in the table below without breaking, deforming the assembly, or cracking the jacket.

ROPE DIAMETER	MINIMUM BREAKING STRENGTH
0.30"	4,000 POUNDS
0.37"	6,700 POUNDS
0.57"	20,800 POUNDS
0.84"	42,400 POUNDS
1.14"	85,000 POUNDS

2.5.3 UV Deterioration Resistance

The cable assembly jacket material shall be capable of maintaining 90 percent of its breaking strength when exposed to 20 iterations of UV Exposure Cycle 6 in accordance with ASTM G154.

2.5.4 Resistance to Salt Fog and Humidity

Each terminated cable assembly shall be capable of withstanding 90% of its breaking strength for 10 minutes after being exposed to a test chamber salt fog for 240 hours in accordance with ASTM B117.

2.5.5 Vibration Resistance

Each terminated cable assembly shall be capable of withstanding a pull text for 10 minutes without breaking or deforming the assembly or cracking the jacket after being subjected to an endurance vibration test for a minimum of 2 hours in accordance with 3.6.4.

2.5.6 Abrasion Resistance

Each cable assembly jacket shall be capable of withstanding abrasion created by shipboard lines and hoses typically passed over the lifelines passing over sheaves or other objects as defined by an abrasion resistance index of 90 or greater in accordance with ASTM D5963

PART 3 EXECUTION

3.1 CLASSIFICATION OF INSPECTIONS

The inspection requirement specified herein are classified as follows:

a. Conformance inspection (see 3.2).

TABLE I. Examinations and Inspections

Test requirement	Requirement Paragraph	Verification Paragraph
Examination	2.2	3.4
Strength Tests	2.6.1 and 2.6.2	3.6.1
UV deterioration tests	2.6.3	3.6.2
Salt fog and humidity test	2.6.4	3.6.3
Vibration test	2.6.5	3.6.4
Abrasion resistance test	2.6.2	3.6.5
Jacket Hardness test	2.4.2	3.6.6

3.2 CONFORMANCE INSPECTION

Conformance inspection shall include the examination of 3.4 and the tests of 3.6.

3.3 EXAMINATIONS

Each terminated cable assembly shall be examined for compliance with the requirements specified above. Terminated cable assemblies shall be subjected to a thorough inspection to ascertain that the material, fittings, joining of parts or assemblies, finish, color, and markings are in accordance with this specification. Terminated cable assemblies shall be inspected to ensure that the jacket is thoroughly bonded to the substrate and free from blisters and air bubbles.

3.4 INSPECTION

3.4.1 Methods of Inspection

Tests identified in 3.6.1 through 3.6.7 may be accomplished on separate test articles and may occur simultaneously. Unless otherwise specified, completed terminated cable assemblies that are to be tested shall be 6 feet plus 1 inch in length. Tests identified in 3.6.1 through 3.6.5 shall be conducted by a certified, independent test facility. Testing conducted within the past 12 months on identical materials and assemblies representative of the materials and assemblies specified herein may be substituted.

3.4.2 Materials and Construction

Conformance shall be determined by examination for the defects listed in Table II. All terminated cable assemblies presented for delivery at one time shall be considered a lot. The sample size of acceptable major and minor defects is shown in Table III. The number of minor defects is shown in Table III. If an unacceptable amount of minor defects are found in any lot, the entire lot shall be rejected.

TABLE II. CLASSIFICATION OF DEFECTS

Category	Defect Major	Method of Examination
	Major	
101	Dimensions affecting interchangeability, out of tolerance	SIE 1/
102	Failure to meet any test acceptance criteria	As specified (3.6)
	Minor	
201	Dimensions not affecting interchangeability, out of tolerance	SIE
202	Nonconformance in design or construction	Visual and SIE
203	Weight not as specified	SIE
204	Improper finish, color or application	Visual
205	Improper marking or identification plates	Visual
206	Logistics support documentation inaccurate or incomplete	Visual
NOTE: 1/ SIE = Standard inspection equipment.		

TABLE III. CONFORMANCE INSPECTION/VERIFICATION SAMPLING

Lot Size	Sampling Size
1 to 8	3
9 to 25	5
26 to 40	7
41 to 65	10
66 to 110	15
111 to 300	25
301 to 500	35
501 to 800	50

3.5 TESTS

3.5.1 Strength Tests

The terminated cable assembly shall be cooled in an environmental chamber for 2 hours at -20 Degrees F (-29 Degrees C). The terminated cable assembly shall be removed from the chamber and immediately pulled to 90 percent of its breaking strength at room temperature and held for 10 minutes. A separate terminated cable assembly shall be heated in an environmental chamber for 2 hours at 140 Degrees F (60 Degrees C). The terminated cable assembly shall be removed from the chamber and immediately pulled to 90% of its breaking strength at room temperature and held for 10 minutes.

3.5.2 UV Deterioration Test

A test chamber shall be equipped with a UV 340 fluorescent light, means to control temperature, and cause condensation to form on the exposed surface of the test specimens. The test chamber shall also be equipped with a means to control and record the relative humidity of the test. Three lifeline jacket material samples shall be tested in accordance with Exposure Cycle 6 of ASTM G154. The three samples shall be tested simultaneously with three control specimens together in the same test chamber for 20 continuous iterations. The relative humidity of the test shall be recorded. The axial tensile strength shall be tested in accordance with ASTM D1623 and recorded for each sample following this test.

3.5.3 Salt Fog Test

Terminated cable assemblies shall be environmentally tested in accordance with ASTM B117 for 240 hours. Environmentally tested terminated cable assemblies shall be pull-tested to 75% of its breaking strength for 10 minutes. The assembly shall not break or deform and the jacket shall be free of cracks as a result of this test.

3.5.4 Vibration

Terminated cable assemblies shall be tested in accordance with the requirements of Type 1 equipment as defined in MIL-STD-167-1. Terminated

cable assemblies fabricated for vibration testing shall be limited to 6 feet in length. Exploratory vibration testing shall be conducted from 4 Hertz to 33 Hertz to determine the critical response prominence. A 2-hour (minimum) endurance test shall be conducted at the response prominence frequency or frequencies most seriously affecting the terminated cable assembly structural integrity. Vibration testing shall be performed at a certified, independent, vibration test facility. Following the vibration test, the terminated cable assembly shall be pull-tested to 75% of its breaking strength.

3.5.5 Abrasion Resistance Testing

The jacket shall be tested for abrasion resistance in accordance with ASTM D5963 to demonstrate that the jacket meets or exceeds the Abrasion Resistance Index specified .

3.5.6 Jacket Hardness Testing

The jacket hardness shall be measured in accordance with ASTM D2240 to demonstrate that the jacket meets or exceeds the hardness specified in 2.4.2.

3.5.7 Terminated Cable Assembly Proof Load Testing

Terminated cable assemblies shall be loaded to their safe working load for 10 minutes prior to bonding material inspection and shipment.

3.5.7.1 Potting Cracks

Each composite pot shall be visually inspected for cracks to verify compliance with the requirements in 2.4.2.

3.5.7.2 Potting Voids

Each composite pot shall be inspected for voids to verify compliance with 2.4.2.

3.6 PACKAGING

3.6.1 Packaging

For acquisition purposes, the packaging requirements shall be as specified in the contract or order. When packaging of material is to be performed by DoD or in-house contractor personnel, these personnel shall contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

3.6.2 Packaging Requirements

Packaging requirements are as follows:

a. Exposed Thread Protection: The exposed threads on the end fittings shall be covered during shipping in a manner that will avoid damage to the threads.

b. Bend Radius: The cable assembly bend radius shall not be less than 4 inches in the package.

-- End of Section --