

MIL-R-83232B (USAF)
1 December 1972
SUPERSEDING
MIL-R-83232A (USAF)
17 November 1971

MILITARY SPECIFICATION

REELS, STATIC DISCHARGE, GROUNDING, 50 FOOT,
GENERAL REQUIREMENTS FOR

1. SCOPE

1.1 This specification covers static discharge grounding reels with 50 feet of grounding cable, furnished with grounding hardware on the free cable end as specified in the applicable specification sheet.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

SPECIFICATIONS

Federal

PPP-B-601	Box, Wood, Cleated-Plywood
PPP-B-636	Box, Fiberboard
PPP-F-320	Fiberboard, Corrugated and Solid, Sheet Stock (Container Grade), and Cut Shapes

Military

MIL-P-116	Preservation, Methods of
MIL-W-5424	Wire Rope, Steel, (Corrosion-Resisting), Flexible, Preformed (For Aeronautical Use)

STANDARDS

Federal

595	Colors
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environmental conditions likely to occur during service usage, they shall be protected against such deterioration in a manner that will in no way prevent compliance with the performance requirements of this specification. Protective coatings that will crack, chip, or scale with use, age, or extremes of climatic and environmental conditions shall not be used.

3.5.2 Fungusproof materials. Materials which are not nutrients for fungi shall be used to the greatest practicable extent. Where materials that are nutrients for fungi must be used, such materials shall be treated with a fungicidal agent acceptable to the procuring activity.

3.5.3 Metals. Metals shall be of the corrosion-resistant types or treated to resist corrosion due to fuels, salt spray, or atmospheric conditions likely to be met in storage or normal service. Metal castings and stampings used in the frame and drum assembly shall possess a low resistivity and have good strength characteristics.

3.5.3.1 Bonding. Metal parts shall be bonded together to prevent the possibility of sparking.

3.5.3.2 Dissimilar metals. Unless protected against electrolytic corrosion, dissimilar metals shall not be used in intimate contact with each other. Dissimilar metals are defined in MIL-STD-889.

3.6 Design and construction. The reel shall be of an open-type cable drum supported by a cantilever style frame. The drum shall provide for automatically retracting the grounding cable by the use of a durable spring motor. The reel shall be designed and constructed to meet the performance requirements specified herein and to withstand the stresses, impacts, vibrations, and other conditions incident to shipping, storage, and service use (see 6.1). The reel shall be so designed that field repair or replacement of parts can be accomplished in a minimum of time without the use of special tools or equipment.

3.6.1 Functional design. The reel shall:

- a. Provide for storage of the 50 feet of grounding cable specified in 3.8.3.
- b. Provide a path for the flow of static electricity (see 3.7.3)
- c. Allow the extension of the cable upon demand
- d. Allow the cable to remain at a desired extended position, and
- e. Automatically retract the cable when the latching mechanism is released by the further extension of the cable.

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3.6.2 Reliability. Reels shall have a specified mean-cycles-between failure (MCFB) of not less than 14,635 cycles for a 500-cycle mission at 0.9 confidence. (See 6.3.1, 6.3.2, and 6.3.3.)

3.6.3 Maintainability. The reel shall be designed and constructed to permit all maintenance needed during the life of the reel to be accomplished at field or lower level maintenance. No maintenance task, including corrective, preventive, and servicing tasks shall require more than 30 minutes of active maintenance downtime.

3.6.4 Component accessibility. Such items as the speed governor control, cable attachment to the drum, latching mechanism, et cetera, shall be easily removed and serviced by nonskilled personnel using common mechanical handtools. The reel shall be designed to insure ease of operation, ease of rapid installation, and ease of general maintenance and repair.

3.6.5 Lubrication. The drum shaft bearings shall be permanently lubricated and sealed for the life of the reel when required. The use of grease fittings shall be limited only to the latching mechanism. The reel shall be so designed that excess grease or oil cannot contaminate the speed control braking area and grounding brush areas.

3.7 Performance

3.7.1 Environmental conditions. The reel shall be capable of satisfactory operation under the following conditions:

- a. Temperatures ranging from -65° to $+125^{\circ}$ F
- b. Rainfall from vertical to 45 degrees from vertical
- c. A relative humidity of 95 ± 5 percent at $160^{\circ} \pm 5^{\circ}$ F
- d. Atmosphere containing salt-laden moisture
- e. Fungus as encountered in tropical climates
- f. Airborne sand and dust particles as encountered in normal and desert operations.

3.7.1.1 Storage temperatures. The reel shall withstand storage temperatures ranging from -80° to $+160^{\circ}$ F.

3.7.2 Automatic rewinding. The reel shall be spring-loaded to automatically retract the length of cable extended in any direction within 90 degrees from the axis of the cable outlet guide from 10 feet to complete extension of the cable at an average speed of 2 to 7 feet per second.

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3.7.3 Electrical resistance. The electrical resistance between the cable free end grounding device or end of cable if no grounding device is furnished (in either an extended or retracted condition) and the contact surfaces on the mounting base of the reel frame shall not exceed 10 ohms.

3.7.4 Vibration forces. The reel shall not be damaged by transport vibration forces as specified under method 514.1 of MIL-STD-810 for category (f) equipment.

3.7.5 Operating position. The reel shall satisfactorily meet the requirements of 3.7.2, 3.7.3, and 3.8.4 in any mounting position specified herein.

3.7.6 Endurance. The reel shall be capable of performing 5,000 cycles without failure (see 6.3.4) to any components of the reel. Fracture, cracking, or severe wear of any part or component of the reel shall be considered a failure.

3.7.7 Static load. When bolted to an appropriate fixture and with the cable completely extended, the reel shall be capable of withstanding a 150-pound static load applied at the cable free end grounding device, or at the free end of the cable if no device is furnished.

3.8 Details of components

3.8.1 Frame. The frame shall be of the cantilever style and shall provide sufficient rigidity to support the drum assembly specified in 3.8.2. A mounting base shall be provided as an integral part of the frame. The mounting base shall not exceed 3 inches in width (parallel to the axis of the drum) and shall be at least 9 inches in length. Two 1/2-inch-diameter holes for mounting bolts shall be symmetrically located in the mounting base on 7-7/8 inch centers.

3.8.1.1 Cable outlet guide. A cable outlet guide shall be provided and shall be so positioned that the cable is extended tangent to the top of the drum (parallel to the base). The cable outlet guide shall prevent the grounding cable from tangling or kinking when being extended or retracted in any direction not exceeding 90 degrees from the axis of the cable outlet guide. The outlet guide shall be so designed that the cable will not fray, crack, or be damaged when subjected to the tests specified herein.

3.8.2 Drum assembly. The drum assembly shall include a spring motor, main shaft and end bearings, declutching device, a speed governor control, drum housing, and other components essential in meeting the performance requirements specified herein. Provisions shall be incorporated to prevent corrosion to the internal parts and components of the drum assembly due to the environmental conditions specified herein. This requirement may be met by either sealing

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the area that houses the components or by utilizing only materials which will not corrode when exposed. The drum assembly shall provide sufficient storage area for the grounding cable specified in 3.8.3. The sides of the drum shall be of sufficient diameter to prevent the cable from slipping off the drum under any condition specified herein. The outer edges of the drum shall be rounded.

3.8.3 Grounding cable assembly. The grounding cable assembly shall consist of the following:

- a. 50 feet of 3/32-inch, 7 x 7 aircraft wire rope conforming to MIL-W-5424, except with a translucent international orange tinted (see color No. 12197 of FED-STD-595), flexible nylon jacketing material at least 1/32 inch thick. The nylon jacketing material shall be resistant to hydrocarbon fuels, alcohols, and common organic solvents; and shall not deteriorate or crack when the cable is kinked or twisted under any of the environmental conditions specified herein.
- b. An adjustable position stop and an elastomeric bumper. The adjustable position stop shall squeeze the cable by tightening two or more bolts to retain its set position. The elastomeric bumper shall be resistant to hydrocarbon fuels and shall have good abrasion-resistant properties.
- c. A grounding device connected to the free end of the cable, as specified in the applicable specification sheet.

3.8.3.1 Grounding cable connections. Connecting the components of the grounding cable assembly together and the cable to the drum assembly shall be accomplished using common handtools. All attachments using a nut and bolt shall include a lockwasher or a self-locking type nut.

3.8.4 Cable latching mechanism. The reel shall be equipped with a latching mechanism to release and restore cable tension. The mechanism shall have four latching positions spaced 90 degrees apart and two latching reset positions 180 degrees apart, and adjacent to two of the latching positions. After latching has occurred, the cable shall remain in an extended position. Further extension of no more than 4-1/2 inches of cable shall cause the latching mechanism to release and permit the cable to retract. Extension of the cable shall result in the latching mechanism being reset by one of the two latching reset positions and then latching (cable remaining in an extended position) shall occur if the cable is released. The latching mechanism shall be so designed that when the cable is in a fully extended condition (cable is mechanically and electrically connected to the drum), it will not result in a release of cable tension. The latching mechanism shall be of the nongravity type, operable in any mounting position of the reel.

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3.8.5 Declutching device. The reel shall be equipped with a safety declutching device to protect the main spring motor from damage and fatigue in the event of severe backlash or reverse rotation.

3.9 Part numbering of interchangeable parts. All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable. The item identification and part number requirements of MIL-STD-100 shall govern the manufacturer's part numbers and changes thereto.

3.10 Dimensions. The envelope dimensions of the reel in an upright position shall not exceed 11 inches in height, 10 inches in depth, and 4 inches in width. These dimensions do not include the adjustable position stop with elastomeric bumper nor any grounding device at the free end of the cable.

3.11 Weight. The weight of the reel, including the cable assembly, shall not exceed 20 pounds.

3.12 Finishes and protective coatings. Cleaning, painting, plating, anodic films, and chemical treatments shall be in accordance with MIL-STD-808. A listing of the procedures used shall be furnished to the procuring activity and shall be included with the report specified in 4.3.2.

3.12.1 Contact surfaces. Paint or other insulators shall not be applied to the contact surfaces, cable, clip, or connector. Contact surfaces on the base specified in 3.8.1 shall be plated.

3.12.2 Finishing. Excluding those surfaces and parts specified in 3.12.1, all exposed surfaces of the reel shall be given a protective finish in accordance with MIL-STD-808. All exposed exterior surfaces, except those specified in 3.12.1, shall be painted yellow, film designation DG.

3.13 Operating instruction plate. An operating instruction plate shall be permanently affixed to the reel adjacent to the nameplate. The plate shall contain brief instructions describing the adjustment procedures necessary to increase or decrease the spring tension. Any appropriate precautionary notes shall also be included on this plate.

3.14 Identification of product. Equipment, assemblies, and parts shall be marked for identification in accordance with MIL-STD-130.

3.15 Workmanship. The reel, including all parts, shall be constructed and finished in a thoroughly workmanlike manner. Particular attention shall be given to freedom from blemishes, defects, burrs and sharp edges; accuracy of dimensions, radii of fillets, and marking of parts and assemblies; thoroughness of welding, brazing, painting, riveting, alignment of parts, and tightness of assembly screws and bolts, et cetera.

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4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier 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 Classification of tests. The inspection and testing of the reel shall be classified as follows:

- a. Preproduction testing See 4.3
- b. Quality conformance inspection See 4.4.

4.3 Preproduction testing (see 6.2)

4.3.1 Test samples. Three reels shall be subjected to the tests specified in 4.3.3. The extent and sequence of testing on each reel shall be tabulated as data pertaining to sample reel A, B, or C. Each sample shall be identified with the manufacturer's serial number which shall be on a nameplate attached to the reel. The data acquired from each reel shall be referenced in the test report by the appropriate serial number.

4.3.1.1 Disposition of tested samples. When the preproduction tests are conducted at a location other than that of the procuring activity, two tested samples shall be submitted to the procuring activity along with the test report (see 6.2).

4.3.2 Test report. Upon completion of the tests, a test report shall be prepared in accordance with MIL-STD-831 and submitted to the procuring activity with the tested samples specified in 4.3.1.1.

4.3.2.1 Failures, reliability and maintenance analysis. The following shall be submitted as an appendix to the test report:

- a. All failures, servicing, adjustments, maintenance, and irregular functioning shall be identified by accumulated operating time, cycles, miles, or position in the test procedure, as appropriate. Test conditions at the time of the events identified shall be recorded.

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- b. A summary of any tests conducted to determine assignable causes for any failure or irregular functioning. The engineering analysis used in assessing the failure and in determining reasons for additional testing shall be included.
- c. A summary of the engineering analysis leading to any corrections made to design, construction, quality control, or other procedures, or leading to any corrections to be made to production items or proposed to be made. The summary shall also include an analysis of the predicted effectiveness of such corrections.
- d. Clock time and man-hours required for each maintenance and servicing action taken during the tests. A brief description of the experience and qualifications of the personnel taking such actions shall be included.
- e. Test activity or contractor comments on item features or requirements that, if modified, should improve the item.
- f. Test activity or contractor comments on use of maintenance conditions to be avoided or cultivated to increase the reliability or useful life of the item.
- g. Any of the above information that is already included in the test report body need not be repeated in the information required by this paragraph, but clear reference to the location of the data shall be included.

4.3.2.2 Listings, drawings, and slides. The following shall be incorporated into the test report as an attachment:

- a. A listing of all components and items noting the manufacturer's name and part number for each component
- b. A listing of all cleaning and finishing procedures in accordance with MIL-STD-808 to be used on the reel and its components. Any protective coatings or metallurgical finishes applied to the reel components shall be described.
- c. Drawings and an explanation of the cable latching mechanism shall be included and shall show how the requirements of 3.8.4 have been met
- d. 35-millimeter colored slides - left front three-quarter view and right rear three-quarter view, with a clear background on one of the sample reels prior to testing and a slide of the test stand with the reel mounted for the endurance test specified in 4.5.9.

4.3.3 Preproduction tests. The preproduction tests shall consist of all tests specified under 4.5. The samples shall be subjected to the tests as listed below in the order shown. The samples may be tested simultaneously; however, if

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failure occurs as a result of any one test, the test program shall be temporarily stopped and the failure reported to the procuring activity. Inability to satisfactorily complete any of the tests specified under 4.5 and to meet any of the associated requirements specified in section 3 shall constitute a failure. A failure shall also be defined according to 6.3.4.1 except failure action, including the amount and sequence of further testing, will be as directed by the procuring activity.

Sample A

Electrical resistance test	4.5.6
Vibration test	4.5.7
Rain test	4.5.8.1
Low temperature exposure and operation test	4.5.8.2
High temperature exposure and operation test	4.5.8.3
Humidity test	4.5.8.4
Salt-fog test	4.5.8.5
Cable retraction test	4.5.2
Electrical resistance test	4.5.6
Disassembly inspection	4.5.8.8

Sample B

Electrical resistance test	4.5.6
Vibration test	4.5.7
Operational position test	4.5.3
Cable outlet guide test	4.5.4
Static load test	4.5.5
Fungus test	4.5.8.6
Dust test	4.5.8.7
Cable retraction test	4.5.2
Electrical resistance test	4.5.6
Disassembly inspection	4.5.8.8

Sample C

Electrical resistance test	4.5.6
Vibration test	4.5.7
Endurance test	4.5.9
Vibration test	4.5.7
Disassembly inspection	4.5.8.8

4.4 Quality conformance inspection. The quality conformance inspection shall consist of the following:

- a. Individual tests See 4.4.1
- b. Operational capability check See 4.4.2.

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4.4.1 Individual tests. Each reel shall be subjected to the examination of product test specified in 4.5.1 and the electrical resistance test specified in 4.5.6.

4.4.1.1 Rejection and retest. When one reel of a production run fails to meet the testing procedures specified in 4.5.1 and 4.5.6, reels still on hand or later produced shall not be accepted until the extent and cause of failure have been determined and appropriately corrected. The contractor shall explain to the Government quality control representative and notify the procuring activity in writing the cause of failure, the action taken to preclude recurrence, and the impact the failure may have on scheduled deliveries. A failure shall be defined according to 6.3.4.1. Category 1 failures shall cause complete discontinuation of tests until the procuring activity reviews the contractor's written analysis of failure and approves any retesting or continuation of tests.

4.4.2 Operational capability check. Sample reels shall be selected at random. Sample size shall be in accordance with MIL-STD-781. A modified endurance test shall be conducted on each selected reel in the following sequence:

- a. Three hundred cycles with the cable extended to its full length
- b. Tests specified in 4.5.2 and 4.5.6
- c. One hundred and fifty cycles with the cable extended 25 ± 1 foot per cycle
- d. One hundred cycles with the cable extended to its full length
- e. Test specified in 4.5.5
- f. Tests specified in 4.5.2 and 4.5.6
- g. Three hundred cycles with cable extended to its full length
- h. Tests specified in 4.5.2 and 4.5.6
- i. One thousand cycles with cable extended 25 ± 1 foot per cycle
- j. Tests specified in 4.5.2 and 4.5.6
- k. Remaining cycles needed to demonstrate compliance with 3.6.2 with cable extended to its full length
- l. Tests specified in 4.5.2 and 4.5.6.

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4.4.2.1 Accept-reject criteria. Accept-reject criteria for the reels tested and selected according to 4.4.2 shall be based on the reliability testing demonstration of 4.5.10.

4.5 Test methods

4.5.1 Examination of product. The reel shall be inspected to determine compliance with the requirements specified herein with respect to materials, coatings and films, workmanship, dimensions, weight, and markings. The grounding cable shall be extended to the last cable tension release position before the cable is fully extended (cable is mechanically and electrically connected to this drum). The cable shall then be further extended to restore the cable tension and the cable shall completely retract onto the reel within the speed range specified in 3.7.2. Failure of the reel to meet the requirements specified in 3.7.2 and 3.8.4 shall be cause for rejection of that reel.

4.5.2 Cable retraction test. The reel shall be mounted on the test stand as shown of figure 1. Padding material, such as foam rubber, soft metals, wood, et cetera, shall not be used. Approximately 10 feet of cable shall be extended from the reel and then the cable allowed to retract until a latch position (cable remains in extended position) is reached. The cable tension shall then be restored by further extension of the cable and the cable permitted to completely retract. The above shall be repeated for cable extensions of 20, 30, and 40 feet, and complete cable extension. The actual extended distances and retraction rates shall be determined and included in the test report. Failure to meet the requirements of 3.7.2 and 3.8.4 shall be cause for rejection.

4.5.3 Operational position test. The reel shall be mounted in an upright position as shown by the position of the rectangular solid on figure 1 and subjected to the test specified in 4.5.2. Upon completion of the first test, the reel shall be rotated 180 degrees about the Z axis (see figure 1) and mounted on the underside of the mounting plate on the test stand. At this position, the test specified in 4.5.2 shall be repeated. Upon completion of the second test, the reel shall be rotated 90 degrees about the Y axis from the upright position shown on figure 1 and the test specified in 4.5.2 repeated. The direction of cable extension shall be in the Z direction for these three reel positions.

4.5.4 Cable outlet guide test. The test specified in 4.5.2 shall be repeated with the cable extended and retracted in various directions at an angle of 90 degrees from the axis of the cable outlet. The latching mechanism shall operate satisfactorily, and the cable shall extend and retract without binding.

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DIMENSION	INCHES	
	MAX	MIN
A	13	12
B	25	24
C	16	15

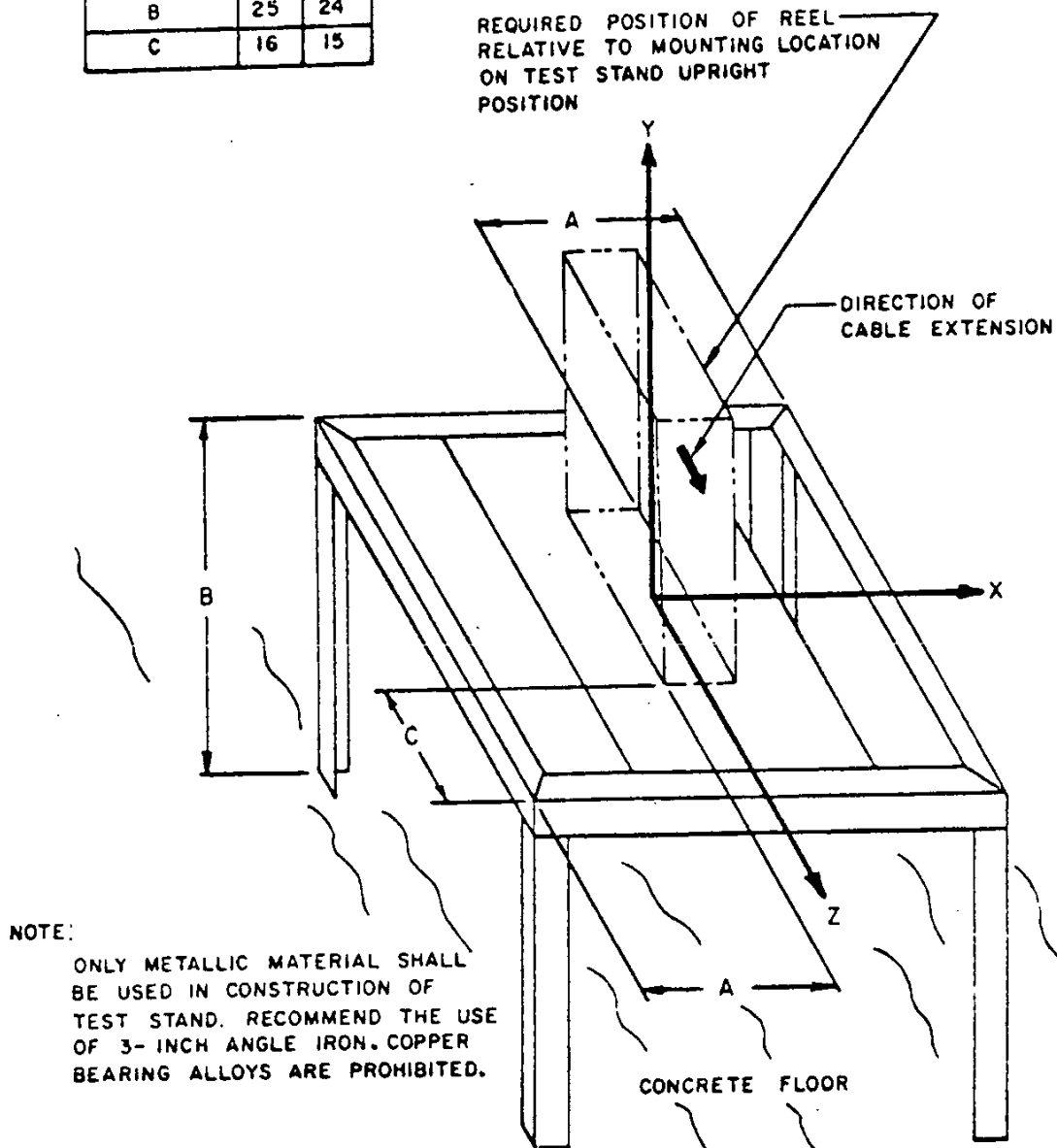


FIGURE 1. Test Positions

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4.5.5 Static load test. A static load of 150 pounds shall be applied to the clip or connector, or to the free end of the cable, as applicable, when the cable is completely extended and the reel bolted to an appropriate fixture. The load shall be applied for a minimum of 5 minutes. Any evidence of failure or impending failure shall be cause for rejection.

4.5.6 Electrical resistance test. With the cable fully extended, the electrical resistance between a contact surface on the base and the grounding device and the free end of the cable (or the end of the cable, if no grounding device is to be furnished) shall be measured by an instrument of laboratory accuracy. The electrical resistance shall not exceed 10 ohms.

4.5.7 Vibration test. The reel shall be subjected to the vibration testing specified in method 514.1 of MIL-STD-810. The reel shall be mounted on an adequate vibration exciter table to simulate mounting on any mobile fuel- or oil-servicing equipment (see the paragraph of method 514.1 entitled Mounting Techniques). Testing method 514.1 shall be based on procedure VIII, equipment category (f), curve (v) of the figure of MIL-STD-810 entitled Vibration Test Curves for Equipment Installed in Ground Vehicles - Equipment Category (f), and 4,000 total vehicle miles. The test shall be performed under room ambient conditions. The reel shall not be operated during application of this test as specified in the paragraph of method 514.1 entitled Test Item Operation. Detailed data on test instrumentation, observed resonances, and damage or indications of impending failure of the frame, base, or drum assembly shall be provided in the test report. Vibration testing not completed because of a failure or impending failure, including any remaining resonance dwell, shall be repeated after corrective action.

4.5.8 Environmental tests. The following environmental tests shall be conducted in accordance with the specified procedures of MIL-STD-810, except as modified herein. Unless otherwise specified (see 6.2), an engineering evaluation may be performed in lieu of conducting the tests specified in 4.5.8.4 through 4.5.8.7. The engineering evaluation shall consist of a written detailed analysis of the reel and all its parts and components to satisfactorily accomplish the required environmental conditions.

4.5.8.1 Rain test. The sample A reel shall be subjected to a rain test in accordance with method 506, procedure I. At the conclusion of the test period, the reel shall be removed from the test chamber within 15 minutes and placed in a cold temperature chamber at +23°F. Any attempt to remove, drain, or evaporate entrapped water within the reel beyond that caused by normal transit in relocating the reel from the rain chamber to the low temperature chamber is prohibited. The temperature of the low temperature chamber shall have stabilized at +23°F prior to positioning the reel in the cold chamber. After 12 hours at +23°F, the grounding cable shall be extended to its full length and the cable shall completely retract onto the reel within the retraction rates specified in 3.7.2.

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4.5.8.2 Low temperature exposure and operation test. The sample A reel shall be subjected to low temperature in accordance with method 502, procedure I. Following the exposure of -80°F for not less than 48 hours, the temperature shall be raised to -65°F and the test specified in 4.5.2 shall be conducted satisfactorily. With the temperature at $-65^{\circ} + 5^{\circ}\text{F}$, a section of the cable shall be formed into a single overhand knot. Sufficient force shall be applied to each end of the knotted section such that the maximum distance across the outer extremities of the knot will not be larger than 1-1/4 inch. The lapsed time in forming this knot shall not exceed 10 seconds. If the nylon jacket on the cable exhibits any cracking or other deterioration as a result of the cold temperature exposure or stresses caused by the overhand knot it shall be cause for rejection. The reel, cable, and, where furnished, the grounding device shall exhibit no evidence of failure or deterioration due to the cold temperature exposure.

4.5.8.3 High temperature exposure and operation test. The sample A reel shall be installed in a chamber and subjected to high temperature in accordance with method 501, procedure I. Following the exposure of $+160^{\circ}\text{F}$, the temperature shall be lowered to $+125^{\circ}\text{F}$ and the test specified in 4.5.2 shall be conducted satisfactorily. The reel shall exhibit no evidence of failure or deterioration due to the high temperature exposure.

4.5.8.4 Humidity test. The sample A reel shall be subjected to humidity in accordance with method 507. The reel shall exhibit no evidence of failure or deterioration due to exposure to the humidity.

4.5.8.5 Salt-fog test. The sample A reel shall be exposed to salt-fog in accordance with method 509, procedure I. The test specified in 4.5.2 shall then be conducted satisfactorily. The reel shall exhibit no evidence of failure or deterioration as a result of these tests.

4.5.8.6 Fungus test. The sample B reel shall be subjected to fungus in accordance with method 508, procedure I. The reel shall exhibit no evidence of failure, damage, or deterioration due to the fungus. The reel may be superficially cleaned after removal from the fungus chamber prior to inspection and operational checks.

4.5.8.7 Dust test. The sample B reel shall be exposed to sand and dust in accordance with method 510, procedure I. The test specified in 4.5.2 shall then be conducted. The reel shall exhibit no evidence of failure or deterioration due to the sand and dust.

4.5.8.8 Disassembly inspection. Sample reels A, B, and C shall be completely disassembled for inspection. The sample reels in a disassembled condition shall be visually inspected and a record made of any deterioration or failure resulting from the tests specified in 4.5. Evidence of failure or deterioration of any part as defined in 6.3.4.1 and 6.3.5 shall be considered as reason to reject the preproduction reels.

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4.5.9 Endurance test. The sample C reel shall be subjected to 5,000 cycles while mounted on the test stand as shown on figure 1 (see 6.3.2). The floor of the test area shall be concrete. The endurance test shall be conducted in the following sequence:

- a. One thousand cycles with the cable extended to its full length
- b. Repeat the tests specified in 4.5.2 and 4.5.6
- c. Five hundred cycles with the cable extended 25 ± 1 foot per cycle
- d. One thousand cycles with the cable extended to its full length
- e. Repeat the tests specified in 4.5.2 and 4.5.6
- f. One thousand cycles with the cable extended to its full length
- g. Repeat the tests specified in 4.5.2 and 4.5.6
- h. Five hundred cycles with the cable extended 25 ± 1 foot per cycle
- i. Repeat the tests specified in 4.5.2 and 4.5.6
- j. One thousand cycles with the cable extended to its full length
- k. Repeat the tests specified in 4.5.2 and 4.5.6.

4.5.10 Reliability test demonstration. Satisfactory completion of the operational capability check specified in 4.4.2 demonstrates compliance with the quantitative reliability requirements. Satisfactory completion shall be based on the accept-reject criteria of test plan V of MIL-STD-781 and the definition of failure as specified in 6.3.4.2. Hours shall be replaced by cycles, MTBF shall be replaced by MCBF, and determination of acceptability shall be based on 14,635 total cycles (specified MCBF) when using test plan V. Failure actions, such as rejection of equipment, verification of repairs, restoration of failed equipment, and completion of reports shall meet the requirements of MIL-STD-781.

4.5.11 Maintainability demonstration. The spring motor shall be removed from the reel and replaced, and the following information recorded:

- a. The actual time (minutes) required to preform the disassembly and reassembly
- b. The tools required to perform the disassembly and reassembly

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c. Any obstruction or projection that hinders the task or presents physical injury to the person performing the disassembly. The grounding cable shall be disconnected at the end of the terminal adjacent to the drum and replaced. The time (minutes) involved in removing the grounding cable at the anchor terminal, and reassembling to the original condition shall be recorded.

4.6 Inspection of preparation for delivery. Preservation, packaging, packing, and marking shall be inspected to determine conformance to the requirements of section 5 herein.

5. PREPARATION FOR DELIVERY

5.1 Preservation and packaging. Preservation and packaging shall be level A or C as specified (see 6.2).

5.1.1 Level A. Each reel shall be packaged in a weather-resistant fiber-board container conforming to PPP-B-636. Cushioning material conforming to PPP-F-320, class weather-resistant, shall be used as pads, cells, sleeves, or die cuts to prevent damage to the reel and prevent free movement within the container. Closure and sealing shall be in accordance with the appendix of PPP-B-636. Preservation and packaging shall meet the method III requirements of MIL-P-116.

5.1.2 Level C. Reels shall be packaged to afford adequate protection against deterioration and physical damage during shipment from the supply source to the first receiving activity. The supplier may use his standard practice provided it meets these requirements.

5.2 Packing. Packing shall be level A, B, or C as specified (see 6.2).

5.2.1 Level A. Reels, preserved and packaged as specified in 5.1, shall be packed in snug-fitting, overseas-type, style optional containers conforming to PPP-B-601. Strapping shall be zinc coated.

5.2.2 Level B. Reels, preserved and packaged as specified in 5.1, shall be packed in snug-fitting, domestic-type containers conforming to PPP-B-601.

5.2.3 Level C. Reels, preserved and packaged as specified in 5.1, shall be packed in containers in a manner that will assure carrier acceptance and safe delivery to the first receiving activity. Containers shall meet either Uniform Freight Classification Rules or rules and regulations of other carriers as applicable to the mode of transportation.

5.3 Marking. In addition to any special marking required by the contract or order (see 6.2), interior packages and exterior shipping containers shall be marked in accordance with MIL-STD-129.

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6. NOTES

6.1 Intended use. The reels covered by this specification are intended for installation on mobile fuel equipment, oil servicing equipment, et cetera, operating in all world-wide environmental conditions.

6.2 Ordering data. Procurement documents should specify the following:

- a. Title, number, and date of the detail specification
- b. The destination(s) of test samples (see 4.3.1.1), and the quantity of copies and destination(s) of test reports (see 4.3.2)
- c. The quantity of copies and destination(s) of failure information, and designation of preparing activity review and approval authority(ies) (see 4.3.3 and 4.4.1.1)
- d. Location and conditions for preproduction testing (see 4.3)
- e. When an engineering evaluation will not be acceptable in lieu of the testing specified in 4.5.8.4 through 4.5.8.7
- f. Applicable levels of preservation, packaging, and packing (see 5.1 and 5.2)
- g. Special shipment marking (see 5.3)

6.3 Definitions. For the purpose of this specification, the following definitions apply:

6.3.1 Mean-cycles-between-failure. The mean-cycles-between-failure (MCBF) for reliability purposes is defined as the average (arithmetic mean) use cycles between failures that could prevent satisfactory operation.

6.3.2 Cycle. A cycle is defined as extending the cable and permitting it to freely rewind upon the reel without imposing any manual restriction upon the rewind rate.

6.3.3 Reliability. Reliability is the probability of performing without failure a specified function under given conditions for a specified period of time. Recognizing that, in general, the rate of failure of equipment is fairly constant throughout the life of the equipment, the probability of nonfailure over an operating time interval decreases exponentially as

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a function of the length of the interval, during which time is a constant failure rate, and can be expressed as follows:

Confidence level: 90 percent

Minimum MCBF = $\frac{\text{Total test cycles}}{2.3}$

Reliability = $e^{-\frac{\text{Mission cycles}}{\text{MCBF}}}$

The 2.3 is based on the constant for the Poisson/Chi squared distribution, assuming an exponential (2 degree freedom) distribution even though the failure rate for the test is zero.

6.3.4 Failures

6.3.4.1 Individual test failures. Individual test failures are defined as follows:

a. Category I - A category I failure is defined as the inability of the reel or any component thereof to meet the quantitative, qualitative, or specific design requirements of the specification such as 3.7.2, 3.7.3, 3.8.4, 3.10, and 3.11. Category I failures may result from and include, but not be limited to, the following:

- (1) The first occurrence of any malfunction whose direct cause is intermittent or unknown.
- (2) A malfunction traceable to two or more parts shall be considered two or more failures when each is found to have independently prevented satisfactory performance.
- (3) A malfunction traceable to two or more parts, none of which alone is capable of producing the malfunction, shall be considered a single failure, even though all affected parts are replaced.
- (4) An equipment malfunction traceable to poor quality workmanship.
- (5) The third occurrence of the same attributing malfunction, listed as a category II type failure, per 6.3.4.1(b).

Individual reels failing to meet any of these requirements shall be rejected.

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b. Category II - A category II failure is defined as a malfunction which does not prevent the equipment from meeting the specified performance requirements. Category II failures may result from and include, but not be limited to, the following:

(1) Any malfunction of the test equipment. In the event that three identical malfunctions occur in the test equipment, a plan will be submitted to the procuring activity detailing the implementation of corrective action to reduce or eliminate the occurrences of this failure.

(2) Any malfunction due to mishandling, maladjustment, or incorrect procedures.

(3) Any malfunction resulting directly from and attributable to another failure, category I or category II. No malfunction shall be considered attributed to another failure when more than 12 hours of operation time has elapsed or one-eighth of the operating cycles have been completed since repair of the chargeable failure.

(4) Malfunctions caused by manufacturing difficulties, such as temporarily out of control processes, or a specific and identified defective lot of parts.

(5) Any malfunction or abnormality noted as result of overall examination of the reel such as noncompliance with the finishing, cleaning, painting, and chemical treatment requirements, MIL-STD-808; with the product identification requirements, MIL-STD-130; and with the workmanship requirements of 3.15.

If a category II failure exists, the procedures specified in 4.4.1.1 shall be applied, except where indicated.

6.3.4.2 Operational capability failure - category III. A category III failure is defined as the inability of the grounding reel cable to extend to its full length or any predetermined length as required during the cycling process. A category III failure is also defined as the inability of the reel to pass the test specified in 4.5.2 according to the requirements of 3.7.2 and 3.8.4 or the inability of the reel to meet the electrical resistance requirements of 3.7.3. A category III failure may result from, but not be limited to, the conditions specified in 6.3.4.1.a.(1) through 6.3.4.1.a.(5).

6.3.5 Deterioration. Deterioration is defined as the impairment to some physical property such as the blistering, peeling, or cracking of a protective coating or plating. Deterioration can also include the swelling, contracting, hardening, or softening of a material. Corrosion and stress cracking is considered a deterioration of the material.

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6.4 Identification of changes. Asterisks are not used in this revision to identify changes with respect to the previous issue, due to the extensiveness of the changes.

Custodian:
Air Force - 11

Preparing activity:
Air Force - 11

Reviewers:
Air Force - 68, 79, 82
DSA-CS

Project No. 4930-F154

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