NOTE: The document identifier and heading has been changed on this page to reflect that this is a performance specification. There are no other changes to this document. The document on subsequent pages has not been changed, but will be changed the next time this document is revised.

MIL-PRF-21402A(OS)
10 January 1967
SUPERSEDING
MIL-C-21402 (NOrd)
28 May 1958

PERFORMANCE SPECIFICATION

CABLES ASSEMBLIES, NON-MAGNETIC (ORDNANCE)

This specification has been approved by the Naval Ordnance Systems Command, Department of the Navy.

1. SCOPE

1.1 Scope. - This specification covers the requirements for the procurement of Cable Assemblies Non-Magnetic type. The Cable Assemblies are for use in or testing of weapons and weapon components.

2. APPLICABLE DOCUMENTS

2.1 The following specifications, standards, drawings and publications or such portions thereof as designated herein of the issue in effect on the date of invitation for bids form a part of this document.

SPECIFICATIONS

MILITARY

MIL-C-5015	Connectors, Electric, "AN" TYPE

STANDARDS

MILITARY

MIL-STD-129	Marking for Shipment and Storage
MIL-STD-202	Test Methods for Electronic and Electric Component Parts
MIL-STD-331	Fuze and Fuze Components, Environmental and Performance Test for

DRAWINGS

NAVAL ORDNANCE SYSTEMS COMMAND

LD No. 284865	Preparation for Delivery of Cable Assemblies

FSC 1075

LD No. 284866	Preparation for Delivery of Test Set Cable Assemblies

PUBLICATIONS

NAVAL ORDNANCE SYSTEMS COMMAND

OD 10511	Basic methods for non-magnetic testing with the Test Set Mark 11 type

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

3. REQUIREMENTS

3.1 Description. - The cable assemblies covered by this specification consist of insulated electrical conductors grouped together in cables, unterminate or terminated with AN connectors or other termination as specified in the applicable drawings. They are of the type in which only limited magnetic properties are permitted and are used to interconnect various components of weapons, and for use with calibrators, test equipment, etc.

3.2 General requirements.

3.2.1 Preproduction sample. - A preproduction sample of the cable assembly shall be manufactured using the methods and procedures proposed for the production lot. The preproduction sample shall be prepared for delivery in accordance with Section 5. This sample will be inspected as specified in Section 4 herein and is for the purpose of determining that the production meets the requirements of this specification and the design. Provision of the sample shall be in accordance with 4.3.1.

3.2.2 Fabrication. - The cable assembly shall be manufactured in accordance with the particular LD pertaining thereto, all documents listed therein, and as specified herein. Inspection and acceptance shall be in accordance with Section 4.

3.2.3 Conflicting requirements. - Conflicting requirements arising between this specification and any other specification, drawing, or publication listed herein shall be referred to the procuring agency or appointed agent in writing for interpretation, clarification and resolution.

3.2.4 Data. - No data is required by applicable documents referenced in Section 2, unless specified in the contract or order.

3.3 Performance requirements and product characteristics. - The cable assembly and its components and assemblies shall meet the following performance requirements and product characteristics:

NOTE: The performance requirements and product characteristics specified below may be modified or omitted, and additional requirements may be included where specified in the contract, order or applicable drawings.

3.3.1 Electrical continuity. - The d-c resistance between all points connected by design shall be 0.2 ohms or less when measured as specified in 4.5.2.2

3.3.2 Insulation resistance. - Each circuit and each unsused pin of the Cable Assembly shall exhibit an insulation resistance of 50 megohms or more at a test potential of 500 volts dc (or other value of insulation resistance and test potential when specified on applicable drawings) with respect to all other non-connected circuits and each unsused pin connected together, to the connector housings and ground, when tested as specified in 4.5.2.3.

3.3.3 Dielectric withstanding voltage. - The Cable Assemblies shall withstand the dielectric withstanding voltage test specified in 4.5.2.4. This test shall be required only when specified in the contract, order or applicable drawings.

3.3.4 Connectors. - After assembly, connectors of Cable Assemblies shall show no damage, shall be capable of being fully mated and unmated by hand without the use of tools, and individual socket type contacts of connectors shall exhibit a force within allowable limits required to engage or disengage a corresponding pin contact, when tested as specified in 4.5.2.5.

3.3.5 Static magnetic effect. - The static magnetic effect of any Cable Assembly shall be such as to cause a total change in the flux density of the background magnetic field of not more than 0.1 milligauss when the Cable Assembly is tested as specified in 4.5.2.6.

3.4 Durability requirements

3.4.1 Vibration. - The Cable Assemblies shall withstand the vibration tests specified in 4.6.1 and thereafter shall show no damage and shall meet all the performance and product requirements of this specification.

3.4.2 Shock; transportation, storage and handling. - The Cable Assemblies shall withstand the shock tests specified in 4.6.2 and thereafter shall show no damage and shall meet all the performance and product requirements of this specification.

3.4.3 Repeated impact. - The Cable Assemblies shall withstand the repeated impact tests specified in 4.6.3 and thereafter shall show no damage and shall meet all the performance and product requirements of this specification.

3.4.4 Temperature and Humidity. - The Cable Assemblies shall withstand the temperature and humidity conditions specified in 4.6.4 and thereafter shall show no corrosion or damage and shall meet all the performance and product requirements of this specification.

3.4.5 Pressure. - Cable Assemblies required to be submersible in the contract, order, or applicable drawings shall withstand the pressure test as specified in 4.6.5 and thereafter shall show no damage and shall meet all the performance and product requirements of this specification.

3.5 Clean-up. - Prior to and after final assembly, all parts, components and the assembly shall be thoroughly cleaned of loose, spattered or excess solder, metal chips and other foreign matter. Burrs and sharp edges as well as rosin flash shall be removed.

3.6 Workmanship. - The equipment, including all parts and accessories, shall be constructed and finished in a manner to assure compliance with all requirements of this specification. Particular attention shall be paid to neatness and thoroughness of soldering, plating, crimping, marking of parts and assemblies, and freedom of parts from burrs and sharp edges. The standard of workmanship exhibited in any approved preproduction sample, subject to any qualification stated in the Government's notice of approval, shall determine the requirements of the contract relative to workmanship insofar as not specifically covered by applicable specifications.

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, the supplier may utilize his own facilities or any commercial laboratory acceptable to 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 inspections. - Inspection of the items covered by this specification shall be classified as follows:

a. Preproduction inspection (See 4.5 and 4.6)

b. Quality conformance inspection (See 4.5)

c. Periodic production inspection (See 4.6)

4.3 Inspection.

4.3.1 Preproduction sample. - A preproduction sample of (10) Cable Assemblies, manufactured in accordance with 3.2.1, shall be subjected to the examinations and tests detailed in 4.5 and 4.6 at an activity designated by the procuring activity. Acceptance of the sample shall be based on no defects in this sample. Further production of the Cable Assembly by the supplier, prior to approval of the sample, shall be at the supplier's risk.

4.3.2 Quality conformance.

4.3.2.1 100 percent inspection. - Each unit shall be subjected to the examinations of 4.5.1 and tests in 4.5.2. Any unit containing one or more defects shall be cause for regarding the unit as defective.

4.3.3 Periodic sampling tests. - After successful completion of the quality conformance inspection of 4.5, the periodic sampling tests of 4.6 shall be conducted on a random sample of (5) Cable Assemblies selected by the Government from each lot of Cable Assemblies offered for acceptance. When a unit fails to pass any periodic sampling test or specified subsequent quality conformance test, examination of the unit shall be made by the contractor to analyze the cause of the failure and corrective action to be taken. When cause of the failure is determined to be supplier nonconformance to the quality conformance test requirements of this specification and/or its associated drawings, the contractor may be required to screen the lot and repair or replace the discrepant part or material and resubmit the lot for complete retesting.

4.4 Special test equipment.- The following items of special test equipment are required to perform the quality conformance inspection specified in 4.5:

NOTE: The test equipment listed below covers the quality conformance tests specified to verify the performance requirements and product characteristics required by 3.3. Where modifications in performance requirements and product characteristics are specified in the contract, order or applicable drawings, suitable additional test equipment shall be required to perform the additional quality conformance tests specified.

4.4.1 A resistance bridge, capable of measuring low resistance (0-1 ohm) to an accuracy of ± 2% or better.

4.4.2 A megohmmeter, capable of measuring resistance to 1000 megohms to an accuracy of ± 10% or better at a test potential of 500 ± 50 volts dc.

4.4.3 Equipment necessary to perform the dielectric withstanding voltage tests specified in MIL-STD-202, Method 301.

4.4.4 Suitable equipment for measuring the axial force required to engage and disengage individual contact sockets of connectors when mated with corresponding contact pins. The equipment shall include special contact test pins, as required, which shall be mated with contact sockets of fully assembled connectors when attached to the Cable Assemblies.

4.4.5 Test Set Mark 115 Mod 4 - Government Furnished.

4.5 Quality conformance inspection.

4.5.1 Examination. - Each Cable Assembly shall be visually and dimensionally examined in accordance with its related CD to determine compliance with this specification and its related LD. Examination in accordance with the CD shall not relieve the contractor of his responsibility to meet all drawing requirements not listed on the CD.

4.5.2 Tests (100%).

4.5.2.1 Test procedure.

NOTES: 1. Test probes shall not be used to make electrical connections to AN connectors or similar connectors of special design. Jigs made up of mating connectors shall be used. Mating connectors may be wired or their solder pots may be used as the test points.

2. Where the contract, order or applicable drawings specify performance requirements and product characteristics in addition to those specified under 3.3, suitable tests in addition to those listed below shall be performed to verify the characteristics specified and the test procedures shall be as approved by the procuring acitvity or contracting officer.

4.5.2.2 Electrical continuity. - With the resistance bridge (4.4.1), measure the resistance between all points designed to be electrically connected, as shown on applicable drawings. In each case the resistance shall be 0.2 ohms or less. Remove test equipment.

4.5.2.3 Insulation resistance. - Acceptance of the cable meeting its insulation resistance value may be made under any conditions of exposure time, humidity and temperature greater than the standard values below, but rejection of any cable failing to meet its insulation resistance value shall only be made when tested after conditioning the cable for 24 hours at a relative humidity of 75 ± 5% and a temperature of 75 ± 5 degrees F. Using the megohmmeter specified in 4.4.2, measure the insulation resistance of each circuit and each unused pin of the Cable Assembly, with respect to all other nonconnected circuits and each unused pin shorted together, to the connector housings and ground. The insulation resistance, measured at a test potential of 500 volts dc, applied for 0.1 second or more for each test point, shall be 50 megohms or more, unless otherwise specified on applicable drawings.

4.5.2.4 Dielectric withstanding voltage. - This test shall be required only when specified in the contract, order or applicable drawings. The Cable Assemblies shall be subjected to the dielectric withstanding voltage test of MIL-STD-202, Method 301. The test voltage shall be applied between each conductor circuit and each unused pin and all other nonconnected conductors, circuits and unused pins connected together and to connector housings and ground. The Cable Assemblies shall be immersed in a water bath, with terminations above water, in such a manner that only the outer sheath is submerged. The water bath shall consititute the ground electrode. In the case of Cable Assemblies containing one or more shields, the shields shall be connected to ground while the insulated conductors and unused pins are being tested, and then the insulated conductors and unused pins shall be connected together and to the shields and potential applied between the shields and ground or water bath. Unless otherwise specified, Cable Assemblies rated at 500 volts or less shall be tested at 1000 volts rms, 60 cycles ac, applied for not less than fifteen (15) seconds. Unless otherwise specified, Cable Assemblies rated at over 500 volts shall be tested at 60 cycles ac at a peak voltage equal to two (2) times the peak value of the rated voltage, plus 1000 volts, applied for not less than fifteen seconds. For dielectric withstanding voltage tests conducted following tests performed on preproduction and periodic production samples, the test potential shall be applied for not less than

sixty (60) seconds. Following dielectric withstanding voltage test, the Cable Assemblies shall pass the insulation resistance test specified in 4.5.2.3. Remove test equipment

4.5.2.5 Connectors

4.5.2.5.1 After assembly, connectors of Cable Assemblies shall be examined for bent pins, cracked insulating inserts, solder flash or other damage. The connector shall be engaged fully with a corresponding mating connector (including the tightening of the coupling ring) and then disengaged. The connector shall engage and disengage freely, by hand, without the use of tools.

4.5.2.5.2 Connectors having socket type contacts shall be tested for contact engaging and separating forces. For each socket of the connector, using the equipment specified in 4.4.4, gradually increasing loads shall be applied axially to a pin of corresponding size until the pin contact engages with, or separates from the socket. Depth of engagement shall conform to that encountered in service. Dimensions of test pins for corresponding socket contacts shall be in accordance with MIL-C-5015 or applicable drawings. The average force required to either engage or separate pins and sockets as measured for a representative sample of Cable Assemblies shall not exceed the average value indicated in Table I. Ninety-six (96) percent of all force values obtained shall not exceed the maximum force indicated in the table, and none of the values shall be less than the minimum force specified.

TABLE I

Contact engaging and separating forces

*Contact size	Force in pounds		
	Average	Maximum	Minimum
16	2.1	3	1/4
12	3.5	5	1/2
8	7.	10	3/4
4	10.5	15	1
0	14.	20	2

* See MIL-C-5015 or applicable drawings.

4.5.2.6 Static magnetic effect. - For this test the Cable Assembly shall be coiled into a disc shape with a diameter as small as possible, in any case not to exceed eight (8) inches, and with the connectors and other terminations in the center. The coiled cable shall be taped with non-magnetic tape to prevent movement within the coil. The side of the disc containing the greatest area of connector surfaces shall be selected as the test face for all tests. The tests shall be conducte in accordance with OD 10511, Method I, with a test distance of 2-1/2 inches between the test face and the magnetometer center. In orientation C of Method I, the disc shall be rotated 360 degrees about its test axis at a uniform rate, with the complete rotation occurring between 4 and 10 seconds. The maximum change in flux density produced in any of the tests shall be 0.1 milliga or less.

4.6 Durability tests.

4.6.1 Vibration. - For this test the Cable Assemblies, packaged as for shipment, shall be rigidly mounted to the vibration table. The Cable Assemblies sha be mounted alternately in three (3) mutually perpendicula orientations. Simple harmonic excitation shall be applie parallel to each of the three principal axes of the Cable Assembly for equal periods of time. The frequency range from 10 to 60 cps may be covered either by slowly cycling at a logarithmic rate between the limits, or by at least 24 discrete frequency steps which have a logarithmic distribution. The vibration amplitude shall be maintaine at 2 ± .2 g vector or 0.10 ± .01 inches (peak-to-peak), whichever is the lesser. The duration of the test in each direction is four hours. The total test duration shall be twelve hours. After completing the above vibration test, the Cable Assembly shall be capable of meeting all performance and product characteristic requirements of this specification.

4.6.2 Shock; transportation storage and handlin The Cable Assemblies packaged as for shipment, shall be dropped cornerwise from a height of thirty (30) inches on a solid steel or concrete surface in such manner that the corner of the package absorbs the full force of the fall. This test shall be repeated until each of the eight (8) corners of the package has received a fall. (The height of thirty (30) inches refers to the distance from the ste or concrete surface to the nearest corner of the Cable Assembly package when suspended prior to fall.) The fall shall be freefall, in that no ropes or other suspending media are attached to the package during the fall.

Following this test, the Cable Assemblies shall be inspected for bent pins or other mechanical damage which could impair function and Cable Assemblies shall meet all the performance and other requirements of this specification.

4.6.3 Repeated impact. - For this test, the Cable Assemblies, when packaged as for shipment, shall be placed on a vibration platform equipped with barriers so as to allow free movement of the Cable Assemblies relative to the platform but prevent them from falling off the platform. The motion of the platform shall be such that any point on the platform moves in a circular path one (1) inch in diameter with the plane of the circle perpendicular to the platform. The frequency shall be within the range of 240 to 300 cycles per minute. The vibration shall be for a period of one-half (1/2) hour on each face of the package. At the conclusion of the test the Cable Assembly shall meet all the performance and other requirements of this specification.

4.6.4 Temperature and Humidity. - The unpackaged Cable Assembly shall be subjected to a temperature and humidity 14 day cycle in accordance with MIL-STD-331 Test No 105. Following this test the Cable Assembly shall be examined for corrosion or damage which would impair its operation, and the Cable Assembly shall meet all the performance and other requirements of this specification.

4.6.5 Pressure. - Cable Assemblies required to be submersible in the contract, order or applicable drawings shall be pressure tested as required by 3.4.5. At the conclusion of the test the cable assembly shall meet all the performance and other requirements specified in this specification.

4.6.5.1 A suitable pressure chamber shall be provided, designed to withstand safely the specified test pressure. The chamber shall be of sufficient size to contain one or more cable assemblies in such manner that the entire cable assemblies, or such portions thereof as are designed to be submerged and exposed to water, may be wholly submerged under pressure within the chamber. The chamber shall contain suitable connectors, stuffing tubes, glands or other means of passing the cables or fittings thereof through the chamber walls to simulate installation of the cable assemblies in actual use, and located so as to permit visual inspection to determine water leakage, and to permit making electrical test connections to each circuit of the cable connectors.

4.6.5.2 The cable assemblies, mounted in the test chamber, shall be submerged in fresh water for the pressure and time specified in the contract, order or applicable drawings. The water used in the chamber shall be maintained above room temperature to prevent moisture condensation on the chamber exterior or in the fittings of the cable assemblies under test.

4.6.5.3 After application of pressure for the specified period of time, and with the pressure still applied, examine all cable assembly conductor terminations, stuffing tubes, glands or other fittings for seepage of water, and then measure insulation resistance in accordance with 4.5.2.3.

4.6.5.4 Any evidence of seepage of water during the test, or decrease in insulation resistance below the values specified in 4.5.2.3 when measured under pressure (4.6.5.3) shall constitute failure to pass the pressure test.

5. PREPARATION FOR DELIVERY

NOTE: The following requirements for preparation for delivery apply only to Cable Assemblies where standard preparation is intended. Where special preparation, packaging or packing is required, the methods specified in the applicable List of Drawings for packaging and packing shall apply.

5.1 Packaging

5.1.1 Level A

5.1.1.1 Cable Assemblies shall be individually packaged in accordance with LD No. 284865. When cable assemblies are supplied with test sets, see LD 284866.

5.1.2 Level C

5.1.2.1 Cable assemblies shall be packaged in a manner which will afford adequate protection from deterioration and physical damage during shipment from the contractor or supply source to the first receiving activity for immediate use.

5.2 Packing

5.2.1 Level A

5.2.1.1 Cable assemblies shall be packed in accordance with LD No. 284865. When cable assemblies are supplied with test sets, see LD No. 284866.

5.2.2 Level C

5.2.2.1 Cable Assemblies shall be packed in a manner which will provide protection from damage during direct shipment from the contractor or supply source to the first receiving activity for immediate use. The type of containers used shall conform to applicable carrier rules and regulations.

5.3 Marking

5.3.1 In addition to any special marking required by the contract or order, all marking shall be in accordance with Military Standard MIL-STD-129.

6. NOTES

6.1 Ordering data. - Procurement documents should include the following:

a. A Government activity or contractor, as appropriate, to perform preproduction and periodic sampling tests.

b. When preproduction samples are waived because of having been submitted on a recent contract, the standards of workmanship exhibited by the previously submitted preproduction sample shall determine the minimum requirements of the current contract relative to workmanship.

c. If the contract establishes periodic production sample sizes at variance with this specification, the contract shall also furnish a new test plan, or in some manner designate the desired level and sequence of testing for each of the sample units.

d. Title, number and date of this specification.

e. Include the following only when the individual component is shipped directly to the Government or furnished as a replacement part. This need not apply when the component is purchased as part of a fully or partially assembled mine.

(1) Packaging level "A"

(2) Special markings, if required.

f. When Cable Assemblies are purchased from a prime contractor for installation into Assembly Condition "D" mine, preparation for delivery shall be adequate to protect the unit prior to installation.

g. If one month's scheduled production is not an acceptable lot size, then lot size should be specified by the contract. If this occurs, the sample sizes of 4.3.3 shall be modified accordingly.

h. Special test equipment to be loaned by the Government and the conditions under which it is loaned.

6.2 Definitions. - The following terms will be used throughout this specification on Cable Assemblies and are here defined for clarity.

6.2.1 Lot. - Unless otherwise specified in the contract or purchase order, lot size is defined as one month's scheduled production.

6.2.2 Cable Assembly. - Reference herein to "Cable Assembly" or "Cable Assemblies" shall mean the particular cable assembly as subject to procurement under the contract or purchase order. If more than one cable assembly is under procurement, samples of each type cable shall be tested for compliance to the requirements of this specification.

SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 119-R004

INSTRUCTIONS

This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity *(as indicated on reverse hereof)*.

SPECIFICATION
MIL-C-21402A(OS) CABLE ASSEMBLIES, NON-MAGNETIC (ORDNANCE)

ORGANIZATION *(Of submitter)*		CITY AND STATE
CONTRACT NO.	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT $

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?
   A. GIVE PARAGRAPH NUMBER AND WORDING.

   B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?

   ☐ YES ☐ NO IF "YES", IN WHAT WAY?

4. REMARKS *(Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)*

SUBMITTED BY *(Printed or typed name and activity)*	DATE

DD FORM 1 APR 63 1426

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Naval Ordnance Systems Command
Washington, D.C. 20360

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