

INCH POUND

MIL-DTL-3241F  
 6 January 2010  
 SUPERSEDING  
 MIL-R-3241E  
 9 July 1985

## DETAIL SPECIFICATION

REELS, CABLE (REELS DR-5( ), DR-7( ),  
 DR-B( ), RC-453( )/G, RL-159( )/U)

INACTIVE FOR NEW DESIGN AFTER 25 FEBRUARY 1998

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

## 1. SCOPE

1.1 SCOPE. This specification covers five types of steel reels for use in storing and transporting field wire and cable, designated as reels DR-5( ), DR-7( ), DR-8( ), RC-453( )/G and RL-159( )/U (see 6.4).

## 2. APPLI CABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in section 3, 4, or 5 of this standard. This section does not include documents cited in other section of this standard or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in section 3, 4, or 5 of this standard, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

## DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-C-10578 - Corrosion Removing and Metal Conditioning Compound (Phosphoric Acid Base)

MIL-W-12332 - Welding, Resistance, Spot, Seam, and Projection, for Fabricating Assemblies of Low-Carbon Steel

MIL-DTL-14072 - Finishes for Ground Based Electronic Equipment

MIL-DTL-53039 - Coatings, Aliphatic Polyurethane, Single Component, Chemical Agent Resistant

Comments, suggestions, or questions on this document should be addressed to Defense Supply Center Philadelphia (DSCP), ATTN: DSCP-NASA, 700 Robbins Avenue, Philadelphia, PA 19111-5096 or e-mail to [dscpg&inspeccomments@dla.mil](mailto:dscpg&inspeccomments@dla.mil) . Since contact information can change, you may want to verify the currency of this address information using ASSIST Online database at <http://assist.daps.dla.mil> .

## MIL-DTL-3241F

## DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-22 - Welded Joint Design

MIL-STD-1907 - Inspection, Liquid Penetrant and Magnetic Particle, Soundness Requirements for Materials, Parts and Weldments

MIL-STD-13231 - Markings of Electronic Items

(Copies of these documents are available online at <http://assist.daps.dla.mil> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

2.2.2 Other Government Documents, Drawings, and Publications. The following other Government documents, drawings, and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

## US ARMY COMMUNICATIONS &amp; ELECTRONICS MATERIAL READINESS COMMAND DRAWINGS

SC-F-639 - Reel DR-5( ), Assembly

SC-F-5697 - Reel DR-7( ), Assembly

SC-DL-90889 - Reel DR-8( ), Drawing and Data List

SC-DL-621036 - Reel RL-159( )/U, Drawing and Data list

DL-A-3003198 - Reel RC-453( )/G, Drawing and Data list

(Copies of these documents are available from US Army Communications & Electronics Material Readiness Command, 12 WD Bldg 601 McAfee Ctr, Fort Monmouth, NJ 07703.)

2.3 Non-Government publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

## AMERICAN SOCIETY FOR QUALITY (ASQ)

ASQ Z1.4 - Sampling Procedures and Tables for Inspection by Attributes

(Copies of this document are available from [www.asq.org](http://www.asq.org) or the American Society for Quality, 611 East Wisconsin Avenue, Milwaukee, WI 53202.)

## ASTM INTERNATIONAL

ASTM E8/E8M - Standard Test Methods for Tension Testing of Metallic Materials

ASTM E10 - Standard Test Method for Brinell Hardness of Metallic Materials

ASTM E18 - Standard Test Methods for Rockwell Hardness of Metallic Materials

ASTM E1444 - Standard Practice for Magnetic Particle Testing

(Copies of these documents are available from [www.astm.org](http://www.astm.org) or ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959.)

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

## 3. REQUIREMENTS

3.1 CONSTRUCTION. Each reel shall be fabricated in accordance with the applicable drawing listed below and with performance characteristics contained herein:

Reel DR-5 ( )	-SC-F-639
Reel DR-7 ( )	-SC-F-5697
Reel DR-8( )	-SC-DL-90889
Reel DR-159( )/U	-SC-DL-621036
Reel RC-453( )/G	-DL-A-3003198

## MIL-DTL-3241F

3.2 Steel reel heads. The heads of the reels, except DR-8( ), shall be made of steel which, after heat treatment, shall have the properties specified below (see 4.10):

Tensile strength	-135,000 p.s.i. minimum (see 4.10.1).
Yield strength (0.1%)	-120,000 p.s.i. minimum (see 4.10.1).
Elongation at rupture	-7 percent minimum (see 4.10.1).
Hardness	-Rockwell C31 to C41 (Brinnell 294 to 381) (see 4.10.2).

3.3 Welding. Whenever practicable, welded joints shall conform to MIL-STD-22 and shall be such that grinding on the finished weld will be unnecessary. Spot, seam and projection welds shall conform to MIL-W-12332. Butt welds shall conform to the requirements specified in the cable reel drawings in paragraph 3.1. When spot or other intermittent welds are used to hold a part, the number of welds shall be at least two.

3.3.1 Cleaning prior to welding. Surfaces to be welded shall be cleaned in accordance with good commercial practice and shall be free from rust, scale, paint, grease, and other foreign material.

3.3.2 Process. Preheating shall be employed where distortion is likely to result from welding. Welds shall have a thorough penetration and good fusion and shall be free from scabs, blisters, abnormal pock marks, crack, voids, slag inclusions, and other harmful defects. Where undesirable internal stresses are likely to result from welding, welded items shall be stress-relieved.

3.3.3 Cleaning after welding. Welded assemblies shall be cleaned to remove rust, scale, oxidation products, and excess flux by sandblasting, wire brushing, or other suitable means. Prior to painting steel parts that have been arc or acetylene welded, parts shall be subjected to vat passivation or a phosphoric acid etch in accordance with MIL-C-10578. Acid used for cleaning shall be completely neutralized and removed. Sandblast cleaned items shall be finished or a protective coating shall be applied within four hours of its cleaning.

3.3.4 Weld inspection. Inspection of weld joints shall be made in accordance with, and meet the requirements of MIL-STD-1907 (see 4.9).

3.4 Fit on axle. When tested as specified in 4.5, the fit on the axle shall be such that the axle can be completely inserted and withdrawn without binding.

3.5 Alignment. On completed reels no point on the circumference of the head shall be more than one-fourth of an inch from the perpendicular to the axle, when tested as specified in 4.6.1. Measurements shall be taken and recorded at four points 90 degrees apart on each head.

3.5.1 Plate alignment on reel RC-453( )/G. On completed reel RC-453( )/G, no point on the circumference of the plates shall be more than one-fourth of an inch from the perpendicular to the drum when tested as specified in 4.6.2. At no time shall the space within the connector compartment be less than 3 inches.

3.6 Vibration. The reels shall show no evidence of permanent degradation including no loosening of parts when tested as specified in 4.7.

3.7 Drop. The reels shall show no evidence of permanent degradation other than deformation, no evidence of loosening of parts and shall exhibit a maximum deformation of no more than one inch when tested as specified in 4.8. Alignment measurements shall be taken before and after each drop to the point of impact. Maximum deformation is the difference between these measurements.

3.8 Moisture resistance. Upon completion of test specified in 4.11, there shall be no evidence of corrosion or any other form of deterioration.

## MIL-DTL-3241F

3.9 Dielectric strength for reel DR-8(). Reel DR-8 ( ) shall withstand the dielectric strength test specified in 4.12, without breakdown.

3.10 Identification marking. All reels shall bear identification markings in accordance with the applicable detailed drawing and MIL-STD-13231 (see 3.1).

3.11 Finish and identification. After assembly, the reels shall be finished in accordance with MIL-DTL-14072, Finish number P210AG. The primer and final paint film shall be applied to all exterior surfaces and to all interior surfaces that can be accessed through the axle and hand holes. Finish on reels shall be smooth and free from defects, and shall be applied after completion of tests specified in 4.7, 4.8, 4.9, and 4.10 have been met. The reel shall be marked with the acronym "CARC" in accordance with a) or b) below:

a) Embossed lettering with a height of  $.060 \pm .010$  inch in an adjacent panel to the panel containing the nomenclature such as "DR-5 ( ), DR-7 ( ), DR-8 ( ), RC-453 ( )/G or RL-159 ( )/U".

The dimensions (in inches) for the embossed lettering are shown in Figure 1 except for the DR-8 reel. The dimensions (in inches) for the embossed lettering for the DR-8 reel are shown in Figure 2.

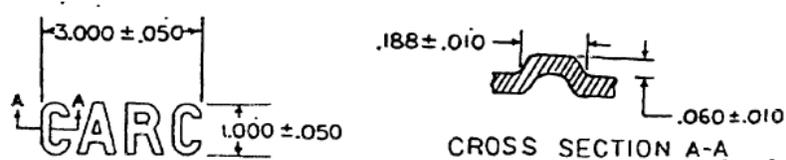


FIGURE 1. EMBOSSED LETTERING  
EXCEPT FOR DR-8 REEL

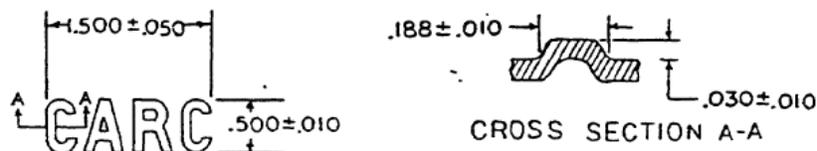


FIGURE 2. EMBOSSED LETTERING  
FOR DR-8 REEL

The marking shall be in accordance with MIL-STD-13231.

b. Stenciled lettering using black CARC paint per MIL-DTL-53039 in an adjacent panel to the panel containing the nomenclature such as "DR-5 ( ), DR-7 ( ), DR-8 ( ), RL-159 ( )/U or RC-453 ( )/G". The marking shall be in accordance with MIL-STD-13231 and given the following lettering sizes:

<u>Type of reel</u>	<u>Lettering Sizes (inches high)</u>
DR-5 ( )	1
DR-7 ( )	1
DR-8 ( )	½
RL-159 ( )/U	1
RC-453 ( )/G	1

## MIL-DTL-3241F

3.12 Workmanship. The reels shall be manufactured and assembled in accordance with the applicable portions of the following paragraphs herein (see 4.4):

- 3.1 ----- Construction.
- 3.3 ----- Welding.
- 3.3.1 ----- Cleaning prior to welding.
- 3.3.2 ----- Process for welding.
- 3.3.3 ----- Cleaning after welding.
- 3.10 ----- Identification marking.
- 3.11 ----- Finish and identification.

3.13 First article. When specified, samples shall be subjected to first article inspection (see 4.2).

#### 4. VERIFICATION

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

- a. First article inspection (see 4.2).
- b. Conformance inspection (see 4.3).

4.2 First article inspection. This inspection shall consist of the inspection specified in Table I and shall include, as referenced on inspection data sheets, inspection specified in subsidiary documents and the supplementary tests. Order and quantity of equipments to be subjected to first article testing shall be as specified in Table I.

4.2.1 Standard of workmanship. Standard of workmanship, 3.12, shall be established during the visual inspection of 4.4.

TABLE I. FIRST ARTICLE TEST SCHEDULE.

TITLE	REQUIREMENT PARA	TEST PARA	SEQUENCE			
			UNIT	UNIT	UNIT	UNIT
SAMPLE			1	2	3	4
Workmanship	3.12	4.4	2	2	2	2
Fit on axle	3.4	4.5	5	6		
Alignment	3.5	4.6	3	3		
Dielectric strength (If applicable)	3.9	4.12	4	4		
Drop test	3.7	4.8			4	3
Vibration	3.6	4.7			3	4
Moisture resistance	3.8	4.11		5		
Steel reel heads	3.2	4.10	(See note below)			
Welds inspection	3.3.4	4.9	1	1	1	1

NOTE: This test should be conducted on two reel heads randomly selected from different batches of heat treated heads prior to assembly.

## MIL-DTL-3241F

4.3 Conformance inspection. The contractor shall perform the inspection specified in 4.3.1 through 4.3.3.4. This does not relieve the contractor of his responsibility for performing any additional inspection which is necessary to control the quality of the product and to assure compliance with all specification requirements. The government reserves the right to review and evaluate the contractor's inspection procedures and examine the contractor's inspection records. The contractor's inspection records for all inspections performed shall accurately reflect the observed attributes (actual measurements shall be recorded if otherwise required by the contract or this specification) for each characteristic identified within the required inspection/test parameters as correlated with the particular product offered to the government (see 6.5).

4.3.1 Group A inspection.

4.3.1.1 Inspection lot. An inspection lot shall consist of all reels of the same type, produced under essentially the same conditions and offered for inspection at one time.

4.3.1.2 Group A tests. Group A tests shall consist of the tests specified in Table II, and shall be made on the same set of sample units in the order shown.

4.3.1.2.1 Sampling plan. Statistical sampling and inspection shall be in accordance with ASQ Z1.4 for general inspection level II. The acceptable quality level (AQL) shall be as specified in Table II. Unless otherwise specified, the Acceptable Quality Limits (AQLs) listed in this section shall be used to establish the sample sizes, however, the acceptance number shall be zero. Major and minor defects shall be defined in ASQ Z1.4.

TABLE II. Group A inspection.

Inspection	Requirement paragraph	Test Method paragraph	AQL (percent defective)	
			Major	Minor
Workmanship	3.12	4.4	1%	4%
Fit on axle	3.4	4.5	see note	
Alignment	3.5	4.6	see note	
Dielectric strength	3.9	4.12	see note	

NOTE: All defects considered major, AQL is 1%.

4.3.2 Group C inspection. This inspection shall consist of the tests specified in Table III, groups C-1 and C-2, and shall be performed on samples that have been subjected to and met group A inspection. Sample units shall be selected at random without regard to their quality except that the samples selected at the start of the contract shall be selected from the first units produced.

4.3.2.1 Group C-1 inspection. The test specified in Table III, group C-1, shall be performed on one unit at the beginning of production and every month, or every 1,000 units, whichever comes first.

4.3.2.2 Group C-2 inspection. Weld inspection shall be performed at the beginning of production and every month or every 2,500 units, whichever comes first. The other tests specified in Table III, group C-2, shall be performed every 5000 units or every three months except that hardness shall be measured in accordance with ASQ Z1.4, Level 2, AQL 1% on each heat treated batch of heads with each batch identified through final assembly and shipment.

## MIL-DTL-3241F

TABLE III. Group C inspection.

Inspection	Requirement paragraph	Test method paragraph
<u>Group C-1</u>		
Drop test	3.7	4.8
<u>Group C-2</u>		
Vibration	3.6	4.7
Moisture resistance	3.8	4.11
Steel reel heads	3.2	4.10
Weld inspection	3.3.4	4.9

4.3.2.3 Noncompliance. The contractor shall immediately report, in writing, each group C failure occurrence, including details of the failure and characteristics affected. The contractor shall immediately investigate the cause of failure and further report the results of investigation and details of the proposed corrective action on (i) the process and materials, as applicable, and (ii) all units of product which were manufactured under the same conditions and which the government considered subject to the same failure. Reports shall be forwarded to the responsible technical activity designated in the contract through the quality assurance representative. After corrective action has been taken, additional sample units shall be subjected to group C inspection (all inspections, or the inspection which the sample failed, at the option of the government and group A inspection may be reinstated; however, final acceptance and shipment will be withheld until the group C reinspection results have shown that the corrective action was effective (see 6.3).

4.3.2.4 Reinspection of conforming group C sample units. Unless otherwise specified, sample units which have been subjected to and passed group C inspection may be accepted on contract, provided that they are resubjected to and pass group A inspection after repair of all visible damage.

4.4 Workmanship. The reels shall be given a thorough visual and mechanical inspection to ascertain that the material, construction, and welding are in accordance with applicable requirements (see 3.12).

4.5 Test for fit on axle. Reels DR-5( ), DR-7( ), RC-453( )/G and RL-159( )/U shall be tested with an axle 1-1/32 inch +0 -1/64 by 1-1/32 inch +0 -1/64 to insure compliance with 3.4. Reel DR-8( ) shall be tested with an axle 11/32 inch +0 -1/64 by the 11/32 inch +0 -1/64 to insure compliance with 3.4.

#### 4.6 Alignment tests.

4.6.1 Reel head. The requirements of 3.5 shall be met for reels DR-5( ), DR-7( ), RC-453( )/G and RL-159( )/U when axle, 1-1/32 inch +0 -1/64 by 1-1/32 inch +0 -1/64 is inserted through the center of reels. The same shall apply for reel DR-8( ) except that the axle size shall be 11/32 inch +0 -1/64 by 11/32 inch +0 -1/64.

4.6.2 Plate alignment on reel RC-453( )/G. The requirements of 3.5.1 shall be met using the drum as a reference.

4.7 Vibration test. The reels shall be subjected to the test of 4.7.1 through 4.7.4. During vibration the unit shall be clamped in its normal operating position on a vibration table that can be controlled to within 10 percent of specified frequencies and amplitudes.

## MIL-DTL-3241F

4.7.1 Direction of vibration. The reels shall be vibrated successively, over the specified ranges of applied frequencies, in three mutually perpendicular directions parallel to the edges of the reels.

4.7.2 Rate of change of vibration frequency. The frequency of the applied vibration shall be varied uniformly at a rate of approximately one Hz per minute.

4.7.3 Amplitude and frequency of applied vibration. The amplitude (one-half of the total excursion) of the vibration table and the frequency range shall be in accordance with the following:

<u>Frequency of vibration (hz)</u>	<u>Amplitude of vibration (in)</u>	
10 to 33	Horizontal	Vertical
	0.020	0.030

4.7.4 Duration of test. The reels shall be vibrated for at least six hours, two hours in each of the three directions specified in 4.7.1.

4.7.5 At the conclusion of the tests, the reels shall be examined for compliance with 3.6.

4.8 Drop test. The drop test shall be performed on the reels specified in 4.8.1 prior to finishing. The reel loaded with wire or cable shall be conditioned in a temperature chamber at -40 degree F for 24 hours prior to the drop test. The drop test shall be conducted immediately as soon as the reel is removed from the temperature chamber. If all the specified drops cannot be completed within 10 minutes after removal, immediately return the reel to the -40 degree F temperature chamber for 1 hour before proceeding to the next 10 minute test period during which the reel may be dropped. After each 10 minute test period, immediately return the reel to the cold temperature chamber before proceeding to the next 10 minute test period until all the specified drops have been completed.

4.8.1 Each type of reel shall be loaded with a weight of wire or cable comparable to its normal use with total weight as follows:

DR-5( )	125 pounds
DR-7( )	133 pounds
DR-8( )	15 pounds
RC-453( )/G	150 pounds
RL-159( )/U	50 pounds

4.8.2 The reel shall be lifted off the floor by use of a hoist, equipped with a quick release device. When the bottom of the reel is 3-1/2 feet above the 2 inch fir platform backed by a concrete floor, it shall be released so as to drop squarely on the periphery of both heads.

4.8.3 The reel shall then be lifted as above, held until motionless, and dropped squarely on one side. Then repeat on other side.

4.8.4 The reel shall be lifted at a single point at the edge of one head, held until motionless, and then dropped so that the reel will land on the opposite head at an angle to the periphery of one head. Repeat the same procedure on the other head.

4.8.5 At the conclusion of the tests, the reel shall be examined for compliance with 3.7.

4.9 Welding inspection. Welding shall be testing for nonvisual defects by magnetic particle method specified in ASTM E1444 for compliance with 3.3.4.

4.10 Steel reel heads.

4.10.1 The yield strength, tensile strength, and elongation at rupture of the steel reel heads shall be tested in accordance with ASTM E8/E8M for compliance with 3.2.

## MIL-DTL-3241F

4.10.2 The hardness of the reel heads shall be tested in accordance with ASTM E10 or ASTM E18 for compliance with 3.2. The test shall be made before paint is applied.

4.11 Moisture resistance test. The reel shall be subjected to fifteen continuous 48 hour moisture resistance cycles. A single cycle shall consist of Steps 1 through 8. The relative humidity shall be maintained between 90 and 98 percent at all times throughout each cycle and during the first conditioning period. The actual temperature of the conditioning periods and during each cycle at steps 2, 4, 6 and 8 shall be within 3 degrees F of the temperature specified.

Condition the reel at 86 degrees F for 24 hours before test.

Step 1. Raise the internal chamber temperature from 86 to 149 degrees F at a rate of not less than 15 degrees F per hour.

Step 2. Maintain the temperature at 149 degrees F for 8 hours.

Step 3. Lower the temperature from 149 to 86 degrees F at a rate of not less than 15 degrees F per hour.

Step 4. Maintain the temperature at 86 degrees F for 20 hours.

Step 5. Lower the temperature from 86 to 68 degrees F within 2 hours.

Step 6. Maintain the temperature at 68 degrees F for 4 hours.

Step 7. Raise the temperature from 68 to 86 degrees F within 2 hours.

Step 8. Maintain the temperature at 86 degrees F for 4 hours.

After completion of the fifteen cycles, condition the reel at 73 degrees F and between 40 and 60 percent relative humidity for 24 hours. Then inspect the reel for any evidence of corrosion or other deterioration. The reel shall meet the requirements of 3.8.

4.12 Dielectric strength test for Reel DR-3( ). Reel DR-8( ) shall be tested as follows for compliance with 3.9:

a. Apply a potential of 500 volts rms, 60 hz, for 1 minute between each binding post of connector M-221 and the unfinished inside of the reel hub.

b. Apply a potential of 500 volts rms, 60 hz, for 1 minute between the two binding posts of connector M-221

## 5. PACKAGING.

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to 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 then managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

## MIL-DTL-3241F

## 6. NOTES

6.1 Intended use. The reels covered by this specification are intended for use in storing and transporting the following length and types of wire and cable:

<u>Designation</u>	<u>Capacity</u>
Reel RL-159( )/U	2 kilometers of wire WD-1A/TT
Reel DR-5( )	1 mile of wire WF-16( )/U
Reel DR-7( )	1000 feet of cable having an outside diameter of 0.700 inch
Reel DR-8	1/2 kilometer of wire WD-1A/TT
Reel RC-453( )/G	1/4 mile of Cable Assembly CX~1606( )/G or CX-11230( )/G or 1 kilometer of Cable Assembly, Fiber optic, CX-XXXXX

6.2 Ordering data. Procurement documents should specify the following:

- a. Title, number and date of the specification.
- b. Type required (see 1.1).
- c. Place of final inspection.
- d. Packaging requirements (see 5.1).

6.3 Group C inspection. Approval to ship may be withheld, at the discretion of the government, pending the decision from the contracting officer on the adequacy of corrective action (see 4.3.3.3).

6.4 Nomenclature. The parenthesis in the nomenclature will be deleted or replaced by a letter identifying the particular design, for example, reel RC-453W/G. As soon as possible after the award of the contract, the contractor should apply to the government office specified in the contract for such information (see 1.1).

6.5 Verification inspection. Verifications by the government will be limited to the amount deemed necessary to determine compliance with the contract and will be limited in severity to the definitive quality assurance provision established in this specification and the contract. The amount of verification inspection by the government will be adjusted to make maximum utilization of the contractor's quality control system and the quality history of the product (see 4.3).

6.7 Subject term (key word) listing.

Transporting  
Spool  
Wire

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

MIL-DTL-3241F

Custodians:

Army - CR  
Navy - YD  
Air Force - 11

Preparing activity:

DLA – IS

(Project 8130-2009-002)

Review activities

Army - MI  
Navy - MC  
Air Force - 99

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST online database at <http://assist.daps.dla.mil>.