

DETAIL SPECIFICATION

FLANGES, COAXIAL LINE, RIGID, AIR DIELECTRIC, GENERAL SPECIFICATION FOR

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

1. SCOPE

1.1 Scope. This specification covers the general requirements for flanges that are used with 50 and 75 ohm, rigid, air dielectric, coaxial transmission lines and parts.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification 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 sections 3 and 4 of this specification, 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 document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

FEDERAL STANDARDS

[FED-STD-H28](#) - Screw-Thread Standards for Federal Services.

COMMERCIAL ITEM DESCRIPTIONS

[A-A-59588](#) - Rubber, Silicone.

DEPARTMENT OF DEFENSE SPECIFICATIONS

[MIL-DTL-14072](#) - Finishes for Ground Based Electronic Equipment.
[MIL-DTL-24044/1](#) - Flange, Fixed, Coaxial Line, Rigid.

DEPARTMENT OF DEFENSE STANDARDS

[MIL-STD-130](#) - Identification Marking of U.S. Military Property.
[MIL-STD-889](#) - Dissimilar Metals.

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

Comments, suggestions or questions on this document should be addressed to DLA Land and Maritime, ATTN: VAT, Post Office Box 3990, Columbus, OH 43218-3990, or emailed to Tubesamps@dlam.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.dla.mil>.

2.3 Non-Government publications. The following documents 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.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME) INTERNATIONAL

[ASME-B46.1](#) - Surface Texture (Surface Roughness, Waviness, and Lay).

(Copies are available online at <http://www.asme.org/> or at ASME INTERNATIONAL, Three Park Avenue, New York, NY 10016-5990.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) INTERNATIONAL

ASTM-A269	-	Tubing for General Service, Seamless and Welded Austenitic Stainless Steel.
ASTM-B16/B16M	-	Rod, Brass, Free-Cutting, Bar and Shapes for use in Screw Machines.
ASTM-B21/B21M	-	Rod, Bar, and Shapes, Naval Brass.
ASTM-B26/B26M	-	Aluminum-Alloy Sand Castings.
ASTM-B85/B85M	-	Aluminum-Alloy Die Castings.
ASTM-B103/B103M	-	Plate, Phosphor Bronze, Sheet, Strip, and Rolled Bar.
ASTM-B108/B108M	-	Aluminum-Alloy Permanent Mold Castings, Standard Specification for.
ASTM-B124/B124M	-	Copper and Copper Alloy Forging Rod, Bar, and Shapes.
ASTM-B140/B140M	-	Copper-Zinc-Lead (Red Brass or Hardware Bronze) Rod, Bars, and Shapes.
ASTM-B211	-	Aluminum and Aluminum-Alloy Bar, Rod, and Wire.
ASTM-B584	-	Castings, Copper Alloy Sand, for General Applications.
ASTM-B700	-	Electrodeposited Coatings of Silver for Engineering Use.
ASTM-D4894	-	Polytetrafluoroethylene (PTFE) Granular Molding and Ram Extrusion Materials, Standard Specification for.
ASTM-D4895	-	Polytetrafluoroethylene (PTFE) Resins Produced from Dispersion.

(Copies are available online at <http://www.astm.org/> or at ASTM INTERNATIONAL, 100 Barr Harbor Drive, P.O. 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 document and the references cited herein (except for related specification sheets), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheets. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern.

3.2 Material. The material shall be as specified herein (see [3.1](#)).

3.2.1 Copper-base alloys.

3.2.1.1 Bar stock. When fabricated from bar stock, flanges shall be made of leaded red brass, leaded brass, or naval brass.

3.2.1.1.1 Leaded red brass. Leaded brass shall be half-hard, in accordance with [ASTM-B140/B140M](#).

3.2.1.1.2 Leaded brass. Leaded brass shall be half-hard in accordance with [ASTM-B16](#).

3.2.1.1.3 Naval brass. Naval brass shall be alloy A or alloy C, half-hard, in accordance with [ASTM-B21](#).

3.2.1.2 Casting. When fabricated by casting, flanges shall be made of leaded tin bronze conforming to alloy 2A or 1B, condition as cast, in accordance with [ASTM-B584](#).

3.2.1.3 Forging. When fabricated by forging, flanges shall be made of leaded brass conforming to alloy 2 of Publication [ASTM-B124](#), or naval brass conforming to alloy A, half-hard, of [ASTM-B21](#).

3.2.2 Aluminum-base alloys.

3.2.2.1 Bar stock and forging. When fabricated from bar stock or by forging, flanges shall be made of aluminum alloy 6061, temper T6, in accordance with [ASTM-B211](#).

3.2.2.2 Sand casting. When fabricated by sand casting, flanges shall be made of aluminum alloy C4A, condition T4; alloy CS43A, condition F; alloy ZG61A, condition T5, or alloy ZG61B, condition T5 in accordance with [ASTM-B26/B26M](#).

3.2.2.3 Die casting. When fabricated by die casting, flanges shall be made of aluminum alloy G8A or alloy SG100A in accordance with [ASTM-B85/B85M](#).

3.2.2.4 Permanent mold casting. When fabricated by permanent mold casting, flanges shall be made of aluminum alloy SG70A, condition T6, or alloy ZC60A, condition T5 in accordance with [ASTM-B108/B108M](#).

3.2.2.5 Finish. When fabricated of aluminum alloy, flanges shall have the finish E-513 specified in [MIL-DTL-14072](#).

3.2.3 Gaskets. "O" ring gaskets supplied with flanges shall be made of silicone rubber conforming to class 2B, grade 50, of Commercial Item Description [A-A-59588](#) (see [3.1](#)).

3.2.4 Inner connector. The inner connector used with the flanges shall be made of phosphor bronze or free-cutting brass in accordance with ASTM Designation B-103 or B-16, as applicable, silver plated in accordance with [ASTM-B700](#). Contact surfaces shall have a 32-microinch finish, or better, before plating (see [3.1](#)).

3.2.5 Insulator. The inner connector insulator shall be made of polytetrafluoroethylene conforming to [ASTM-D4894](#) and [ASTM-D4895](#) (see [3.1](#)).

3.2.6 Locating pin. The locating pin shall be made of corrosion-resisting (stainless) steel, type 303 of [ASTM-A269](#) (see [3.1](#)).

3.2.7 Bolts. The bolts, nuts, and lock washers supplied with flanges shall be made of corrosion-resisting (stainless) steel, type 303 or 316 in accordance with [ASTM-A269](#) (see [3.1](#)).

3.2.8 Dissimilar metals. Unless suitability protected against the electrolytic corrosion, dissimilar metals shall not be used in contact with each other (see [6.5.1](#)).

3.2.9 Pure tin. The use of pure tin, as an underplate or final finish, is prohibited both internally and externally. Tin content of flange components and solder shall not exceed 97 percent, by mass. Tin shall be alloyed with a minimum of 3 percent lead, by mass (see [6.7](#)).

3.3 Interface and construction. Flanges shall be of the interface, construction and physical dimensions specified (see [3.1](#)).

3.3.1 Condition. When specified (see [6.2](#)), flanges shall be annealed before finish machining.

3.3.2 Threaded parts. All threaded parts shall be in accordance with [FED-STD-H28](#).

3.4 Surface roughness. When surface roughness is determined as specified in [4.6.4](#), all finished mating and inner surfaces of the flanges shall be 63 root mean square microinches or better.

3.5 Voltage standing wave ratio (VSWR). When tested as specified in [4.6.2](#) or [4.6.2.1](#) the indicated VSWR of the insulator bullet assembly and the flanges shall not exceed 1.03:1.

3.6 Insertion force. When measured as specified in 4.6.3, the insertion force of the inner connector into the inner conductor of the line shall be as specified.

<u>Line size</u>	<u>Force (pounds)</u>
7/8	7 to 18
1-5/8	10 to 20
3-1/8	10 to 20
6-1/8	25 to 40

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

3.8 High potential. The flanges and insulator bullet assemblies shall show no evidence of voltage breakdown when tested as specified in 4.6.5.

3.9 Marking. Flanges shall be marked in accordance with MIL-STD-130, with the part number and the manufacturer's code symbol. Marking shall be in depressed or raised characters approximately .094-inch high, in the location specified (see 3.1).

3.10 Workmanship. Flanges shall be processed in such a manner as to be uniform in quality, and all surfaces shall be free of burrs, die marks, chatter marks, scratches, dirt, grease, scale, splinters and other defects that will affect life, serviceability, or appearance.

4. VERIFICATION

4.1 Test equipment and inspection facilities. The test equipment and inspection facilities shall be of sufficient accuracy, quality, and quantity to permit performance of the required inspection. The supplier shall establish calibration of inspection equipment to the satisfaction of the Government.

4.2 Classification of inspection. The examination and testing of flanges shall be classified as follows:

- a. Materials inspection (see 4.3).
 - b. Conformance inspection (see 4.5).
- (1) Inspection of product for delivery (see 4.5.1).

4.3 Materials inspection. Materials inspection shall consist of verification that the materials listed in table I, used in fabricating the flanges, are in accordance with the applicable referenced specifications or requirements prior to such fabrication. Except for Navy acquisitions, a certificate of analysis furnished by the supplier may constitute verification.

TABLE I. Material Inspection.

Material	Requirement paragraph	Applicable specification or publication
Copper-base alloys:	3.2.1	---
Bar stock:	3.2.1.1	---
Leaded red brass	3.2.1.1.1	ASTM-B140/B140M
Leaded brass	3.2.1.1.2	ASTM-B16/B16M
Naval brass	3.2.1.1.3	ASTM-B21/B21M
Castings (leaded tin bronze)	3.2.1.2	ASTM-B584
Forging:		
Leaded brass	3.2.1.3	ASTM-B124/B124M
Naval brass	3.2.1.3	ASTM-B21/B21M
Aluminum-base alloys:	3.2.2	---
Bar stock and forging	3.2.2.1	ASTM-B211
Sand casting	3.2.2.2	ASTM-B26/B26M
Die casting	3.2.2.3	ASTM-B85/B85M
Permanent mold casting	3.2.2.4	ASTM-B108/B108M
Silicon rubber	3.2.3	A-A-59588
Phosphor bronze	3.2.4	ASTM-B103/B103M
Corrosion-resisting (stainless) steel	3.2.6 and 3.2.7	ASTM-A269
Polytetrafluoroethylene	3.2.5	ASTM-D4894, ASTM-D4895

4.4 Inspection conditions. Unless otherwise specified herein, all inspection shall be made at room ambient temperature, relative humidity, and pressure.

4.5. Conformance inspection.

4.5.1 Inspection of product for delivery. Inspection of product for delivery shall consist of groups A, B, and C.

4.5.1.1 Inspection lot. An inspection lot, as far as practicable, shall consist of all the flanges of the same PIN, produced under essentially the same conditions, and offered for delivery at one time.

4.5.1.2 Rejected lots. If an inspection lot is rejected, the supplier may withdraw the lot, rework it to correct the defects, or screen out the defective units, as applicable, and reinspect. Such lots shall be separate from new lots and shall be clearly identified as reinspected lots.

4.5.1.3 Group A inspection. Group A inspection shall consist of the examinations or tests specified in [table II](#) and shall be made on the same set of samples.

TABLE II. Group A Inspection.

Examination or test	Requirement paragraph	Method paragraph
Visual and mechanical	3.1, 3.3	4.6.1
Interface and construction	3.3.1 and 3.3.2	---
Workmanship	3.10	---
Marking	3.9	---
Surface roughness	3.4	4.6.4

4.5.1.3.1 Sampling plan. This specification utilizes an accept on zero defect ($c = 0$) sampling plan. Statistical sampling and inspection shall be performed on an inspection lot basis with a random sample of flanges selected in accordance with [table III](#). No failures shall be permitted.

TABLE III. Group A sampling plan.

Lot size	Sample size
1 - 13	100 percent
14-150	13
151-280	20
281-500	29
501-1200	34
1201-3200	42
3201-10,000	50
10,001-35,000	60
35,001-150,000	74
150,001-500,000	90
500,001 and over	102

4.5.1.3.2 Disposition of sample units. Sample units which have passed the group A inspection may be delivered on the contract or order if the lot is acceptable.

4.5.1.4 Group B inspection. Group B inspection shall consist of the test specified in [table IV](#).

4.5.1.4.1 Sampling plan. The sampling plan shall be in accordance with [table III](#) for sample inspection. Unless otherwise specified herein, inspection shall be used. Acceptance shall be based upon the zero defect sampling plan in [table III](#).

4.5.1.4.2 Disposition of sample units. Sample units which have passed the group B inspection may be delivered on the contract or order if the lot is acceptable.

TABLE IV. Group B Inspection.

Examination or test	Requirement paragraph	Method paragraph
Insertion force	3.6	4.6.3

4.5.1.5 Group C inspection. Group C inspection shall consist of the tests specified in [table V](#).

4.5.1.5.1 Sampling plan. Four sample units of each type on order shall be selected from the first quantities produced. Thereafter, four samples of each type from every 500 or fraction thereof produced, or four samples of each type from each month's production, whichever occurs first.

4.5.1.5.2 Disposition of sample units. Sample units which have passed the group C inspection may be delivered on the contract or order if the lot is acceptable.

TABLE V. Group C inspection.

Examination or test	Requirement paragraph	Method paragraph
VSWR of insulator bullet assembly	3.5	4.6.2
Alternate method	3.5	4.6.2.1
High potential	3.8	4.6.5

4.6 Method of examination and test.

4.6.1 Visual and mechanical examination. Flanges shall be examined to verify that the interface, construction, physical dimensions, workmanship and marking are in accordance with the applicable requirements (see 3.1, 3.3, 3.3.1, 3.3.2, 3.4, 3.9, and 3.10).

4.6.2 Voltage standing wave ratio (VSWR). The test set-up for measuring VSWR of the flanges and insulator bullet assembly shall be as shown in figure 1 or the alternate method shown in figure 2. The VSWR indicators shall be accurate to within 2 percent. The slotted lines should be as nearly alike electrically as possible with a corrected VSWR on the order of 1.005:1. With the flanges and bullet assembly in place at "A", and the test frequency set, the VSWR of the load shall be adjusted to 1.005:1 or less as read with slotted line #2. A measurement shall be now made with slotted line #1. The VSWR now measured is the VSWR of the bullet and the flanges, and shall not exceed the amount specified (see 3.5). If the flanges acquired are to be used at frequencies other than those in the range specified, the test frequencies to be used shall be specified (see 6.2).

<u>Line Size</u>	<u>Test frequencies (MHz)</u>				
7/8	100	750	1500	2250	3000
1-5/8	50	600	1200	1800	2500
3-1/8	50	300	600	900	1200
6-1/8	10	150	300	450	600

4.6.2.1 Alternate method. The test set-up shown in figure 2 may be used as an alternate method for VSWR measurement. Two short lengths of the applicable size transmission line shall be used for "L" and provisions shall be made to keep the inner conductor centered while maintaining low reflections. Flanges shall be attached to the lines using Electronic Industries Alliance (EIA) mating dimensions. A filler ring, made of the same metal as the flanges, shall be used in the insulator slot. The thickness and outside diameter of the ring shall be made to fill the slot to within .002 inch. The inside diameter of the ring shall be the same diameter and tolerance as the inside diameter of the outer conductor. A straight through bullet with no undercut or insulator shall be used to connect the inner conductors at point "A" in the initial set-up. Bullet dimensions "A" and "B" shall be the same as that specified in the specification sheet for the applicable bullet. Dimension "C" shall allow the two center conductors to butt up against the bullet shoulders but not distort the straightness of the center conductors. Dimensions "D" and the tolerance shall be the same as the outside diameter of the inner conductor with which it mates. With the straight through bullet and filler ring in place and the proper test frequency set, the VSWR of the load shall be adjusted to 1.005:1 or less. The straight through bullet and filler ring shall be removed and the insulator bullet assembly to be tested inserted. The VSWR now measured is the VSWR of the bullet and should not exceed the amount specified (see 3.5). Test frequencies shall be the same as in 4.6.2.

4.6.3 Insertion force. Inner connectors shall be tested using a spring scale and a nominal diameter length of inner conductor to verify that the insertion force of the inner connector into the inner conductor is as specified (see 3.6).

4.6.4 Surface roughness. Surface roughness shall be determined in accordance with ASME-B46.1 (see 3.4).

4.6.5 High potential. The specified 60-cycle voltage (see 3.1) shall be applied between the inner conductor and the outer conductor of the line with the insulator bullet assembly in the line between two flanges. The voltage shall be applied at approximately 500 volts per second until the rated test voltage is reached or breakdown occurs. The rated voltage shall be applied for 1 minute. The test shall be performed at a temperature of approximately 23°C and at a pressure of approximately 30 inches of mercury absolute. The relative humidity shall be no greater than 50 percent. When facilities are not available for meeting these test conditions, the test may be conducted at the prevailing atmospheric conditions. In case of dispute, retest shall be made under the test conditions specified herein, either at the manufacturer's plant or at a laboratory satisfactory to the agency concerned.

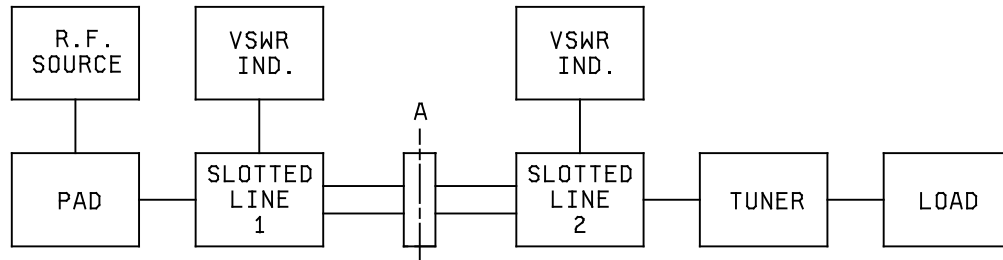
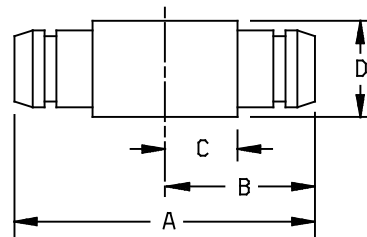
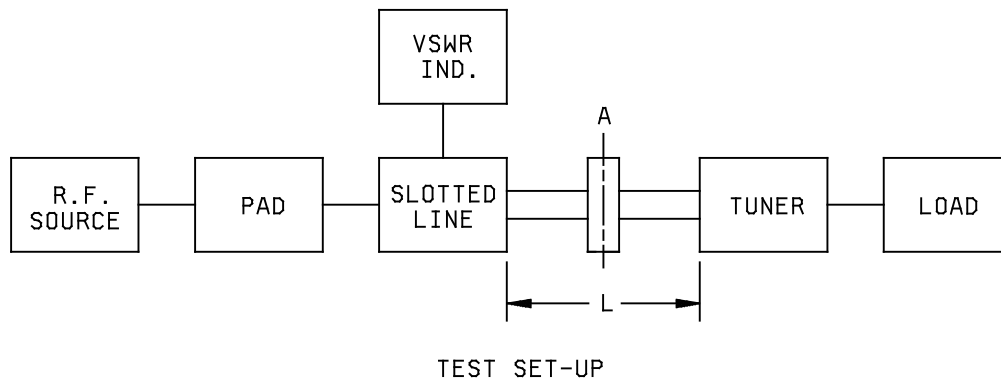


FIGURE 1. Method of measuring VSWR.



STRAIGHT THROUGH BULLET

FIGURE 2. Alternate method of measuring VSWR.

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 requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

(This section contains information of a general or explanatory nature which may be helpful, but is not mandatory.)

6.1 Intended use. These flanges are intended for use as a means of mechanically and electrically connecting rigid coaxial air dielectric transmission lines and parts.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number, and date of this specification.
- b. Title, number, and date of the applicable specification sheet, and the complete PIN (see 3.1).
- c. Whether flanges are to be annealed before finish machining (see 3.3.1).
- d. Alternate test frequencies, if any, for VSWR (see 4.6.2).
- e. Packaging (see 5.1).

6.2.1 Hardware. Necessary "O" rings, bolts, nuts, and lock washers must be supplied with the flanges as specified in the contract or order (see 3.2.3 and 3.2.7).

6.3 Additional information. Flanges and insulator bullet assemblies should be acquired separately. A coupling consists of two flanges and one insulator bullet assembly. The supplier should not substitute for a specified material or fabricated part unless he obtains approval from the Government. At the discretion of the Government, test samples may be required to prove the suitability of the proposed substitute.

6.4 Subject term (key word) listing.

Aluminum alloys
Annealed Insulator
Connector
Copper alloys
Corrosion resistance
Gaskets
Transmission lines
VSWR

6.5 Definitions. For the purpose of this specification, the following definition apply:

6.5.1 Dissimilar metals. Dissimilar metals are defined in MIL-STD-889.

6.6 Environmentally preferable material. Environmentally preferable materials should be used to the maximum extent possible to meet the requirements of this specification. As of the dating of this document, the U.S. Environmental Protection Agency (EPA) is focusing efforts on reducing 31 priority chemicals. The list of chemicals and additional information is available on their website at <http://www.epa.gov/osw/hazard/wastemin/priority.htm>. Included in the list of 31 priority chemicals are cadmium, lead, and mercury. Use of the materials on the list should be minimized or eliminated unless needed to meet the requirements specified herein (see section 3).

6.7 Tin whisker growth. The use of alloys with tin content greater than 97 percent, by mass, may exhibit tin whisker growth problems after manufacture. Tin whiskers may occur anytime from a day to years after manufacture and can develop under typical operating conditions, on products that use such materials. Conformal coatings applied over top of a whisker-prone surface will not prevent the formation of tin whiskers. Alloys of 3 percent lead, by mass, have shown to inhibit the growth of tin whiskers. For additional information on this matter, refer to [ASTM-B545](#) (Standard Specification for Electrodeposited Coatings of Tin).

6.8 Changes from previous issue. The margins of this specification are marked with vertical lines to indicate where changes from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

Custodians:
Army - CR
Navy - EC
Air Force - 85
DLA - CC

Preparing activity:
DLA - CC

(Project 5985-2013-012)

Review activities:
Navy - MC

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 <https://assist.dla.mil>.