MILITARY SPECIFICATION

FLANGES, COAXIAL LINE, RIGID

AIR DIELECTRIC,

GENERAL SPECIFICATION FOR

This specification has been approved by the Department of Defense and is mandatory for use by the Departments of the Army, the Navy and the Air Force.

1. SCOPE

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

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

QQ-S-365 - Silver Plating, Electrodeposited; General Requirements for.
PPP-S-566 - Boxes, Folding, Paperboard.
PPP-B-576 - Box, Wood, Cleated, Veneer, Paper Overlaid.
PPP-B-585 - Boxes; Wood, Wire-bound.
PPP-B-591 - Boxes, Fiberboard, Wood-cleated.
PPP-B-601 - Boxes, Wood, Cleated-Plywood.
PPP-B-621 - Boxes, Wood, Nailed and Lock-Corner.
PPP-B-636 - Box, Fiberboard.
PPP-B-640 - Boxes, Fiberboard, Corrugated Triple Wall.
PPP-B-665 - Boxes, Paperboard, Metal-Stayed (Including Stay Material).
PPP-B-676 - Boxes, Set-up, Paperboard.

MILITARY

MIL-P-116 - Preservation, Methods of.
MIL-O-4861 - "O" Rings, Rubber, Preformed Packing; Packing of.
MIL-R-5847 - Rubber, Silicone; Low- and High-Temperature and Tear Resistant.
MIL-F-14072 - Finishes for Ground Signal Equipment.
MIL-M-14077 - Molding Plastic, Polytetrafluoroethylene (TFE-Fluorocarbon Resin).
MIL-F-24044/1 - Flanges, Fixed, Coaxial Line, Rigid.
MIL-F-24044/2 - Flanges, Rotatable, Coaxial Line, Rigid.

STANDARDS

MILITARY

MIL-STD-10 - Surface Roughness Waviness and Lay.
MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-129 - Marking for Shipment and Storage.
MIL-STD-130 - Identification Marking for U. S. Military Property.

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

2.2 Other publications.- The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

NATIONAL BUREAU OF STANDARDS
Handbook H28 - Screw-Thread Standards for Federal Services.

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, D. C., 20402.)

OFFICIAL CLASSIFICATION COMMITTEE
Uniform Freight Classification Rules.

(Application for copies should be addressed to the Official Classification Committee, One Park Avenue, at 33rd Street, New York, N. Y., 10016.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
A-269-62T - Stainless Steel, Austenitic for General Service, Seamless and Welded, Specification for.
B-16-60 - Free Cutting Brass, Rods, Bars, and Shapes for Use in Screw Machines.
B-21-62 - Naval Brass Rod, Bar and Shapes.
B-26-62T - Aluminum-Base Alloy Sand Castings.
B-85-60T - Aluminum-Base Alloy Die Castings.
B-103-62 - Phosphor Bronze Plate, Sheet, Strip and Rolled Bar.
B-108-62T - Aluminum-Base Alloy Permanent Mold Castings.
B-124-55 - Copper and Copper-Alloy Forging Rod, Bar and Shapes.
B-140-58 - Leaded Red Brass (Hardware Bronze) Rod, Bar and Shapes.
B-143-61 - Tin Bronze and Lead Tin Bronze Sand Castings.
B-211-62 - Aluminum Alloy Bars, Rods and Wire.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race St., Philadelphia, Pa., 19103.)

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

3. REQUIREMENTS

3.1 Specification sheets.- The individual part requirements shall be as specified herein and shall be in accordance with the applicable specification sheets listed in section 2 of this specification.

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 Publication ASTM B-140.

3.2.1.1.2 Leaded brass.- Leaded brass shall be half-hard in accordance with Publication ASTM B-16.

3.2.1.1.3 Naval brass.- Naval brass shall be alloy A or alloy C, half-hard, in accordance with Publication ASTM B-21.

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 Publication ASTM B-143.

3.2.1.3 Forging.- When fabricated by forging, flanges shall be made of leaded brass conforming to alloy 2 of Publication ASTM B-124, or naval brass conforming to alloy A, half-hard, of Publication ASTM B-21.

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 Publication ASTM B-211.

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 Publication ASTM B-26.

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 Publication ASTM B-85.

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 Publication ASTM B-108.

3.2.2.5 Finish.- When fabricated of aluminum alloy, flanges shall have the finish E-513 specified in Specification MIL-F-14072.

3.2.3 Gaskets.- "O" ring gaskets supplied with flanges shall be made of silicone rubber conforming to class II B, grade 50, of Specification MIL-R-5847 (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 Publication ASTM Designation B-103 or B-16, as applicable, silver plated in accordance with Specification QQ-S-365. 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 MIL-M-14077 (see 3.1).

3.2.6 Locating pin.- The locating pin shall be made of corrosion-resisting (stainless) steel, type 303 of Publication ASTM A-269 (see 3.1).

3.2.7 Bolts.- The bolts, nuts, and lockwashers supplied with flanges shall be made of corrosion-resisting (stainless) steel, type 303 or 316 in accordance with Publication ASTM A-269 (see 3.1).

3.3 Design and construction.- Flanges shall be of the design, 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 Handbook 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 (V.S.W.R.).- When tested as specified in 4.6.2, or 4.6.2.1, the indicated V.S.W.R. 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.

Line size	Force (pounds)
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 High potential.- The flanges and insulator bullet assemblies shall show no evidence of voltage breakdown when tested as specified in 4.6.5.

3.8 Marking.- Flanges shall be marked in accordance with Standard MIL-STD-130, with the part number and the manufacturer's code symbol. Marking shall be in depressed or raised characters approximately 3/32-inch high, in the location specified (see 3.1).

3.9 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. 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.

4.1.1 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) Quality conformance inspection (see 4.5).

(1) Inspection of product for delivery (see 4.5.1).
(2) Inspection of preparation for delivery (see 4.5.2).

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 procurements, a certificate of analysis furnished by the supplier may constitute verification.

Table I - Materials 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	B-140
Leaded brass	3.2.1.1.2	B-16
Naval brass	3.2.1.1.3	B-21
Castings (leaded tin bronze)	3.2.1.2	B-143
Forging:		
Leaded brass	3.2.1.3	B-124
Naval brass	3.2.1.3	B-21
Aluminum-base alloys:	3.2.2	---
Bar stock and forging	3.2.2.1	B-211
Sand casting	3.2.2.2	B-26
Die casting	3.2.2.3	B-85
Permanent mold casting	3.2.2.4	B-108
Silicone rubber	3.2.3	MIL-R-5847
Phosphor bronze	3.2.4	B-103
Corrosion-resisting (stainless) steel	3.2.6 and 3.2.7	A-269
Polytetrafluoroethylene	3.2.5	MIL-M-14077

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

4.5 Quality 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 part number, 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. Rejected lots shall be inspected using tightened inspection.

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.

4.5.1.3.1 Sampling plan.- Statistical sampling and inspection shall be in accordance with Standard MIL-STD-105 for normal inspection. The acceptable quality level (AQL) shall be as specified in table II. Major and minor rejects shall be as defined in Standard MIL-STD-105.

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.

Table II - Group A inspection.

Examination or test	Requirement paragraph	Method paragraph	AQL (percent) defective)	
			Major	Minor
Visual and mechanical	3.1, 3.3	4.6.1	1.0	4.0
Design and construction	3.3.1 and 3.3.2	---		
Workmanship	3.9	---		
Marking	3.8	---		
Surface roughness	3.4	4.6.4		

4.5.1.4 Group B inspection.- Group B inspection shall consist of the test specified in table III.

4.5.1.4.1 Sampling plan.- The sampling plan shall be in accordance with Standard MIL-STD-105 for small-sample inspection. Unless otherwise specified herein, normal inspection shall be used at the start of the contract. The AQL and inspection level shall be as specified 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 III - Group B inspection.

Examination or test	Requirement paragraph	Method paragraph	AQL (percent defective)	Inspection level	
				Normal and Tightened	Reduced
Insertion force	3.6	4.6.3	4.0	S-4	S-3

4.5.1.5 Group C inspection.- Group C inspection shall consist of the tests specified in table IV.

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 IV - 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	3.7	4.6.5

4.5.2 Inspection of preparation for delivery.- Sample items and packs shall be selected and inspected in accordance with Specification MIL-P-116 to verify conformance with requirements in section 5 of this specification.

4.6 Methods of examination and test.-

4.6.1 Visual and mechanical examination.- Flanges shall be examined to verify that the design, 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 and 3.6).

4.6.2 Voltage standing wave ratio.- The test set-up for measuring V.S.W.R. of the flanges and insulator bullet assembly shall be as shown in figure 1 or the alternate method shown in figure 2. The V.S.W.R. indicators shall be accurate to within 2 percent. The slotted lines should be as nearly alike electrically as possible with a corrected V.S.W.R. on the order of 1.005:1. With the flanges and bullet assembly in place at "A", and the test frequency set, the V.S.W.R. 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 V.S.W.R. now measured is the V.S.W.R. of the bullet and the flanges, and shall not exceed the amount specified (see 3.5). If the flanges procured 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).

Line size	Test frequencies (megacycles)				
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 V.S.W.R. 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 E.I.A. 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 0.002 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. Dimension "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 V.S.W.R. 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 V.S.W.R. now measured is the V.S.W.R. 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.- The 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).

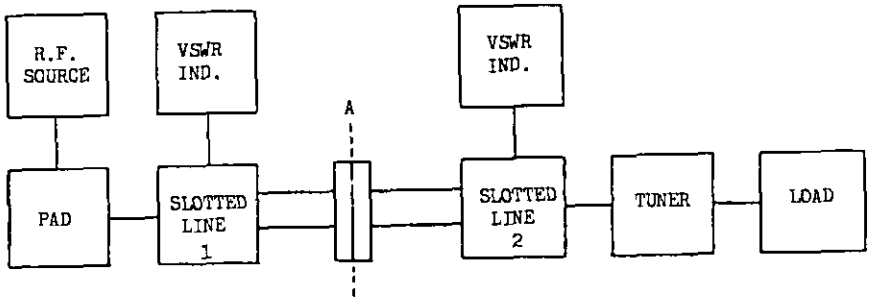
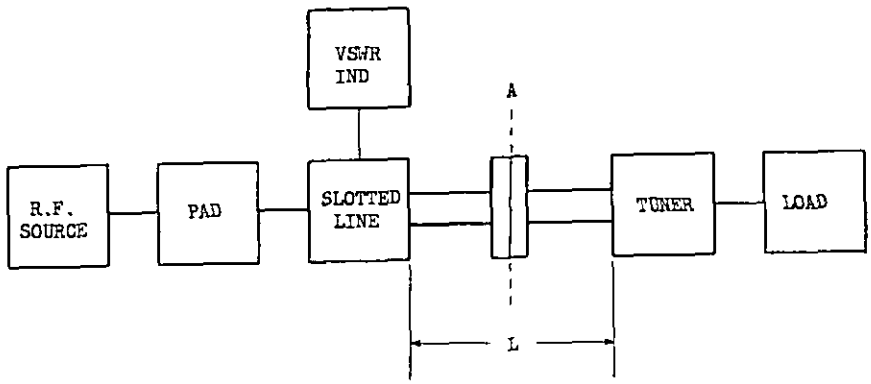
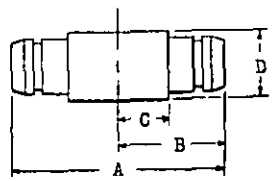


Figure 1 - Method of measuring VSWR



TEST SET-UP



STRAIGHT THROUGH BULLET

Figure 2 - Alternate method of measuring VSWR

4.6.4 Surface roughness.- Surface roughness shall be determined in accordance with Standard MIL-STD-10 (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 bureau or agency concerned.

5. PREPARATION FOR DELIVERY

5.1 Preservation and packaging.-

5.1.1 Level A.- Unless otherwise specified (see 6.2), flanges shall be individually protected and unit-packaged in accordance with method IA-8 of Specification MIL-P-116, without the use of contact preservatives. Unless otherwise specified (see 6.2), when method IA-8 is used for items weighing more than 1 pound, the package shall be placed in unit containers conforming to Specification PPP-B-566, PPP-B-665, or PPP-B-676. Mounting hardware and gaskets procured with flanges shall be included within each unit package (see 6.2.1).

5.1.1.1 When mounting hardware is purchased separately, it shall be individually protected and unit-packaged in accordance with method IA-8 of Specification MIL-P-116, without the use of contact preservatives.

5.1.1.2 When gaskets or "O" rings are purchased separately, they shall be packaged in accordance with Specification MIL-O-4861.

5.1.2 Level C.- The flanges shall be preserved and packaged in such a manner that will afford adequate protection against corrosion, deterioration, and physical damage during shipment from supply source to the supplier's commercial practice when such meets the requirements of this level.

5.2 Packing.-

5.2.1 Level A.- The packaged flanges shall be packed in containers conforming to any of the following specifications at the option of the supplier:

Specification	*Container*	Class or style
PPP-B-576	Wood, Cleated, Veneer Paper Overlaid	Class 2
PPP-B-585	Wood, Wire-bound	Class 2 or 3
PPP-B-591	Fiberboard, Wood-Cleated	Style A or B
PPP-B-601	Wood, Cleated-Plywood	Style A or B
PPP-B-621	Wood, Nailed and Lock-Corner	Class 2
PPP-B-636	Fiberboard	Class 2
PPP-B-640	Fiberboard, Triple Wall	Class 2

Box closures and strapping shall be as specified in the applicable box specification or appendix thereto. Banding (reinforcement requirements), excluding metal, is required and shall be applied in accordance with the provisions outlined in the appendix to the specification. The gross weight of wood boxes shall not exceed 200 pounds; contents of fiberboard boxes shall not exceed limitations of the applicable box specification.

5.2.2 Level B.- The flanges shall be packed in accordance with paragraph 5.2.1 except that the containers shall be constructed for domestic requirements. Fiberboard boxes shall be bonded as prescribed in the appendix of the box specification. Box closures shall be as specified in the applicable box specification or appendix thereto.

5.2.3 Level C.- The packaged flanges shall be packed in containers of the type, size, and kind commonly used for the purpose, in a manner that will insure acceptance by common carrier and safe delivery at destination. Shipping containers shall comply with the Uniform Freight Classification Rules, or regulations of other carriers as applicable to the mode of transportation.

5.2.4 Insofar as possible and practical, exterior containers shall be uniform in shape and size, shall be of minimum cube and tare consistent with the protection required, and shall contain identical quantities of identical items.

5.3 Marking.- In addition to any special marking required by the contract or order, unit packages, intermediate packages, and exterior shipping containers shall be marked in accordance with Standard MIL-STD-129.

6. NOTES

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 Ordering data.- *Procurement documents should specify the following:*

(a) Title, number, and date of this specification.
(b) Title, number, and date of the applicable specification sheet, and the complete part number (see 3.1).
(c) That the supplier shall not substitute for a specified material or fabricated part unless he obtains approval from the Government. Evidence to substantiate his claim that such a substitute is suitable shall be submitted with his request. Similar notification and substantiating evidence shall be submitted at any later time if substitution becomes necessary or desirable. At the discretion of the Government, test samples may be required to prove the suitability of the proposed substitute.
(d) Whether flanges are to be annealed before finish machining (see 3.3.1).
(e) Alternate test frequencies, if any, for V.S.W.R. (see 4.6.2).
(f) Levels of preservation and packaging and packing, and applicable marking (see 5.1 and 5.2).
(g) Method of preservation and packaging of Specification MIL-P-116, if other than method IA-8 (see 5.1.1).
(h) Class of fiber (see 5.2.2).

6.2.1 Hardware.- Necessary "O" rings, bolts, nuts, and lockwashers shall 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 shall be procured separately. A coupling consists of two flanges and one insulator bullet assembly.

Custodians:
Army - EL
Navy - Ships
Air Force - SEG

Preparing activity:
Navy - Ships
(Project 5985-0324)

Reviewers:
Army - EL, MI, MU
Navy - Ships
Air Force - SEPSD (Code 11), SGMES (Code 85), RASSE (Code 17)

Review/user information is current as of the date of this document. For future coordination of changes to this document, draft circulation should be based on the information in the current DODISS.

Users:
Army - MO
Navy - WP, MC

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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.

SPECIFICATION

ORGANIZATION	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 62 1426 REPLACES NAVSHIPS FORM 4863, WHICH IS OBSOLETE