

INCH-POUND

MIL-A-19521B(SH)  
04 May 1992  
SUPERSEDING  
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30 January 1961  
(See 6.5)

## MILITARY SPECIFICATION

ANODE RETAINING SUPPORT PLUGS AND ANODE SELECTION  
AND INSTALLATION DESIGN CRITERIA FOR  
SHIPBOARD CONDENSERS AND HEAT EXCHANGERS

This specification is approved for use by the Naval Sea Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

## 1. SCOPE

1.1 Scope. Appendix A of this specification establishes basic selection and installation criteria for the application of zinc (type ZEP, ZRN, and ZDM) and iron corrosion preventive anodes to copper, nickel, or iron alloy components of shipboard condensers and heat exchangers. This specification covers the threaded plugs used as support plugs for types ZRN and ZDM zinc anodes conforming to MIL-A-18001 and iron anodes.

1.2 Classification. The support plugs for heat exchanger zinc or iron anodes shall be of the following types and classes as specified (see 6.2):

## Anode designation:

- Type I - (for use with ZRN or iron anodes).
- Type II - (for use with ZDM anodes).

## Plug thread designation:

- Class A - Straight thread O-ring seal.
- Class B - Tapered pipe thread (replacement use only not for new construction).
- Class C - Straight thread O-ring plugs for MS16142 or SAE J 1926 type boss.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 5523, Department of the Navy, Washington, DC 20362-5101 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 5340

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

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## 2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 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 shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

## SPECIFICATIONS

## FEDERAL

PPP-F-320 - Fiberboard: Corrugated and Solid, Sheet Stock (Container Grade) and Cut Shapes.

## MILITARY

MIL-S-196 - Support Items, Accessories and Kits, Mechanical; Packaging of.  
 MIL-S-1222 - Studs, Bolts, Hex Cap Screws, Socket Head Cap Screws and Nuts.  
 MIL-C-15726 - Copper-Nickel Alloy, Sheet, Plate, Strip, Bar, Rod and Wire.  
 MIL-A-18001 - Anodes, Sacrificial Zinc Alloy  
 MIL-L-19140 - Lumber and Plywood, Fire Retardant Treated.

## STANDARDS

## FEDERAL

FED-STD-H28 - Screw-Thread Standards for Federal Services.  
 FED-STD-H28/7 - Pipe Threads, General Purpose.

## MILITARY

MIL-STD-792 - Identification Marking Requirements for Special Purpose Components.  
 MS16142 - Boss, Gasket Seal Straight Thread Tube Fitting, Standard Dimensions for.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Bldg. 4, Sec. D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.1.2 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 are those cited in the solicitation.

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## DRAWINGS

### NAVAL SEA SYSTEMS COMMAND (NAVSEA)

NAVSEA 803-5959186 - Submarine Heat Exchanger Anode Plugs.

NAVSEA 803-4385176 - FW/SW Standard Anode Plug Design.

(Application for copies should be addressed to Commander, Portsmouth Naval Shipyard, Naval Engineering Drawing Support Activity, Code 202.2, Portsmouth, NH 03801.)

**2.2 Non-Government publications.** The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

### AMERICAN IRON AND STEEL INSTITUTE (AISI)

Steel Products Manual

(Application for copies should be addressed to the American Iron and Steel Institute, 350 Fifth Avenue, New York, Ny 10017.)

### AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

B 151 - Standard Specification for Copper-Nickel-Zinc Alloy  
(Nickel Silver) and Copper-Nickel Rod and Bar. (Metric)

B 164 - Standard Specification for Nickel-Copper Alloy Rod and Bar.  
(DOD adopted)

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

### SOCIETY OF AUTOMOTIVE ENGINEERS, INC (SAE)

J 1926 - Specification for Straight Thread O-Ring Boss Port

(Application for copies should be addressed to the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15086.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

**2.3 Order of precedence.** In the event of a conflict between the text of this document and the references cited herein (except for related associated detail specifications, specification sheets or MS standards), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

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## 3. REQUIREMENTS

3.1 Anode design, selection and installation. The design, selection and installation of anodes shall meet the requirements of appendix A. Support plugs for use aboard submarines and for reactor plant components must also meet the requirements of NAVSEA Drawings 803-5959186 and 803-4385176 respectively.

3.2 Design requirements for anode support plugs. Design requirements for anode support plugs shall be as follows:

3.2.1 Materials. Materials for class A and C anode support plugs shall be in accordance with table I (see 6.2).

TABLE I. Class A and C material.

Material	Specification
Copper-nickel alloy, alloy 715 (70-30)	ASTM B 151 or MIL-C-15726
Nickel-copper alloy	ASTM B 164

3.2.1.1 Materials for class B anode support plugs shall be in accordance with table II (see 6.2).

TABLE II. Class B material.

Material	Specification
Copper-nickel alloy, alloy 715 (70-30)	ASTM B 151 or MIL-C-15726
Copper-nickel alloy, composition (90-10)	MIL-C-15726

3.2.2 Support plug sizes, dimensions and tolerances. Plugs shall conform to the sizes, dimensions, and tolerances specified herein (see 6.2) and as shown on figures 1 through 6.

3.2.3 Threads. Plugs shall be threaded as indicated on figures 1 through 6 and in accordance with FED-STD-H28.

3.2.3.1 The plug threads shall be sharp and clean and shall be concentric with the axis of the fitting.

3.2.3.2 The internal threads shall be countersunk at the end a distance of not less than one-half the pitch of the thread and at an angle of about 45 degrees with the axis of the thread. For class B plugs, the external thread shall also be chamfered in a like amount for the purpose of easier entrance in making these joints and for the protection of the threads.

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3.3 Detail of heads. The tops of the plugs shall be flat and chamfered. The angle of chamfer with the top surface shall be 30 degrees and the diameter of the top circle shall be the maximum width across flats, within a tolerance of minus 15 percent.

3.3.1 Class A and C plugs shall have provision for positive locking by wiring.

3.4 Hydrostatic. The plugs shall show no evidence of leaking water or sweat at any part of the surface when tested as specified in 4.3.

3.5 Marking. The size (external thread), the manufacturer's name or trademark, and the generic name and composition of the material used (for example, CuNi 70/30), shall be permanently marked on the top surface of the head. Marking shall be in accordance with MIL-STD-792.

3.6 Workmanship. The plugs shall be sound, true to form, uniform in texture, and free from porosity or any other defect which might affect their serviceability. They shall be thoroughly cleaned both inside and outside. Any burrs and roughness shall be removed.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection as part of the manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.2 Quality conformance inspection. Quality conformance inspection shall consist of the examinations specified in 4.2.2 and 4.2.3 and the test specified in 4.3.

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4.2.1 Lot. Plugs of the same type and size offered for delivery at one time shall be considered a lot for purpose of inspection.

4.2.2 Visual examination. Each plug shall be visually examined to verify compliance with those requirements of this specification not involving testing. Any plug in the sample containing one or more visual defects shall not be offered for delivery.

4.2.3 Dimensional examination. Each plug shall be dimensionally examined to verify conformance with dimensional requirements of this specification. Any sample plug which does not meet the dimensional requirements shall not be offered for delivery.

4.3 Hydrostatic test. As a minimum, the contractor shall randomly select a sample quantity from each lot of plugs in accordance with table III and subject them to the tests of 4.3.1 and 4.3.2. The sample size depends on the lot size. If one or more plugs fail the test, the entire lot shall be rejected. The contractor has the option of screening 100 percent of the rejected lot for the defective characteristics, or providing a new lot, which shall be tested in accordance with the sampling plan contained herein. The contractor shall maintain for a period of 3 years after contract completion, records of tests, inspections, and any resulting rejections.

TABLE III. Sample size for hydrostatic test.

Lot size	Sample size
2 to 8	All
9 to 90	8
91 to 150	12
151 to 280	19
281 to 500	21
501 to 1200	27
1201 to 3200	35
3201 to 10,000	38
10,001 to 35,000	46
35,001 to 150,000	56

4.3.1 Class A and C support plugs. Class A and C support plugs shall be subjected to a hydrostatic pressure of 1,500 pounds per square inch (lb/in<sup>2</sup>). This pressure shall be held for a minimum of 10 minutes to ensure that no leakage occurs.

4.3.2 Class B support plugs. Class B support plugs shall be subjected to a hydrostatic pressure of 750 lb/in<sup>2</sup>. This pressure shall be held for a minimum of 10 minutes to ensure that no leakage occurs.

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4.4 Inspection of packaging. Sample packages and the inspection of packaging (preservation, packing and marking) for shipment, stowage, and storage shall be in accordance with the requirements of section 5 and the documents specified therein.

## 5. PACKAGING

(The packaging requirements specified herein apply only for direct Government acquisition. For the extent of applicability of the packaging or preparation for delivery requirements of referenced documents listed in Section 2, see 6.3.)

5.1 General.5.1.1 Navy fire-retardant requirements.

- (a) Lumber and plywood. Unless otherwise specified (see 6.2), all lumber and plywood including laminated veneer material used in shipping container construction members, blocking, bracing, and reinforcing shall be fire-retardant treated material conforming to MIL-L-19140 as follows:

Levels A and B	- Type II - weather resistant.
	Category I - general use.
Level C	- Type I - non-weather resistant.
	Category I - general use.

- (b) Fiberboard Fiberboard used in the construction of interior (unit and intermediate) and exterior fiberboard boxes including interior packaging forms shall conform to the class-domestic/fire-retardant or class weather resistant/fire-retardant material requirements, as specified (see 6.2), of PPP-F-320 and amendments thereto.

5.2 Packaging requirements.

5.2.1 Plugs. Plugs shall be preserved level A, B, C, or Commercial, packed level A, B, C or Commercial as specified (see 6.2) and marked in accordance with MIL-S-196 and applicable packaging acquisition options therein as specified (see 6.2).

5.2.2 Anodes. Anodes shall be preserved level A, C, or Commercial, packed level A, B or Commercial as specified (see 6.2) and marked in accordance with MIL-A-18001 and applicable packaging acquisition options therein as specified (see 6.2).

## 6. NOTES

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



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6.1 Intended use. Plugs and anodes covered by this specification are intended for use in corrosion protection (cathodic protection) of heat exchangers and other equipment employing sea water. Iron heat exchanger components are to be protected by zinc anodes only. Class B support plugs are for replacement use only and are not to be used for new construction.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Types required (see 1.2).
- (c) Classes required (see 1.2).
- (d) Issue of DODISS to be cited in the solicitation, and is required, the specific issue of individual documents referenced (see 2.1.1, 2.1.2, and 2.2).
- (e) Material required, if contractor is not to be permitted to choose among materials authorized for the respective classes (see 3.2.1 and 3.2.1.1).
- (f) Sizes required (see 3.2.2).
- (g) When fire retardant lumber and plywood is not required (see 5.1.1(a)).
- (h) Class of fire retardant fiberboard required (see 5.1.1(b)).
- (i) Level of preservation, level of packing and other packaging acquisitioning options required (see 5.2.1 and 5.2.2).

6.3 Sub-contracted material and parts. The packaging or preparation for delivery requirements of referenced documents listed in section 2 do not apply when material and parts are acquired by the contractor for incorporation into the equipment and lose their separate identity when the equipment is shipped.

6.4 Subject term (key word) listing.

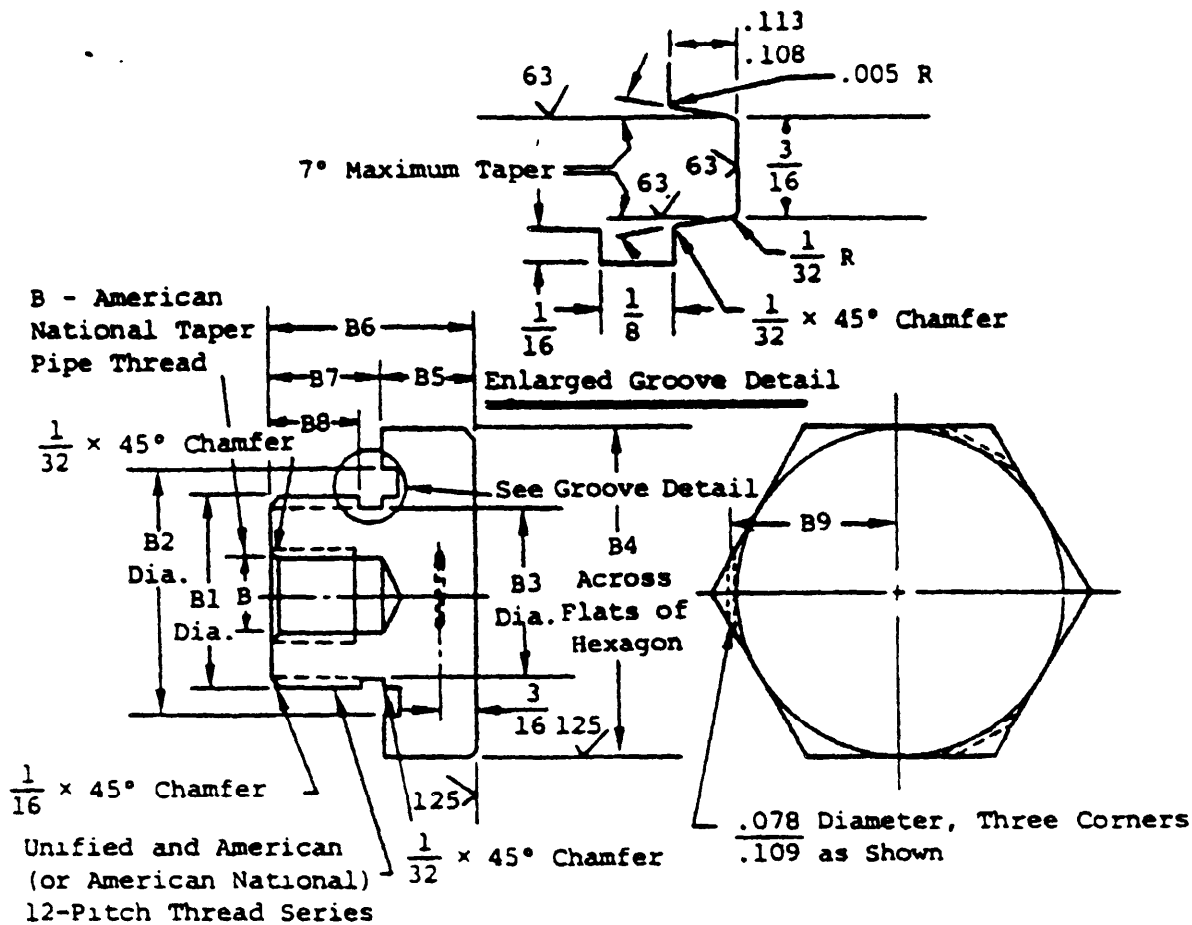
Cathodic protection  
Corrosion preventive  
Fittings  
Zinc

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

Preparing activity:  
Navy - SH  
(Project 5340-N112)



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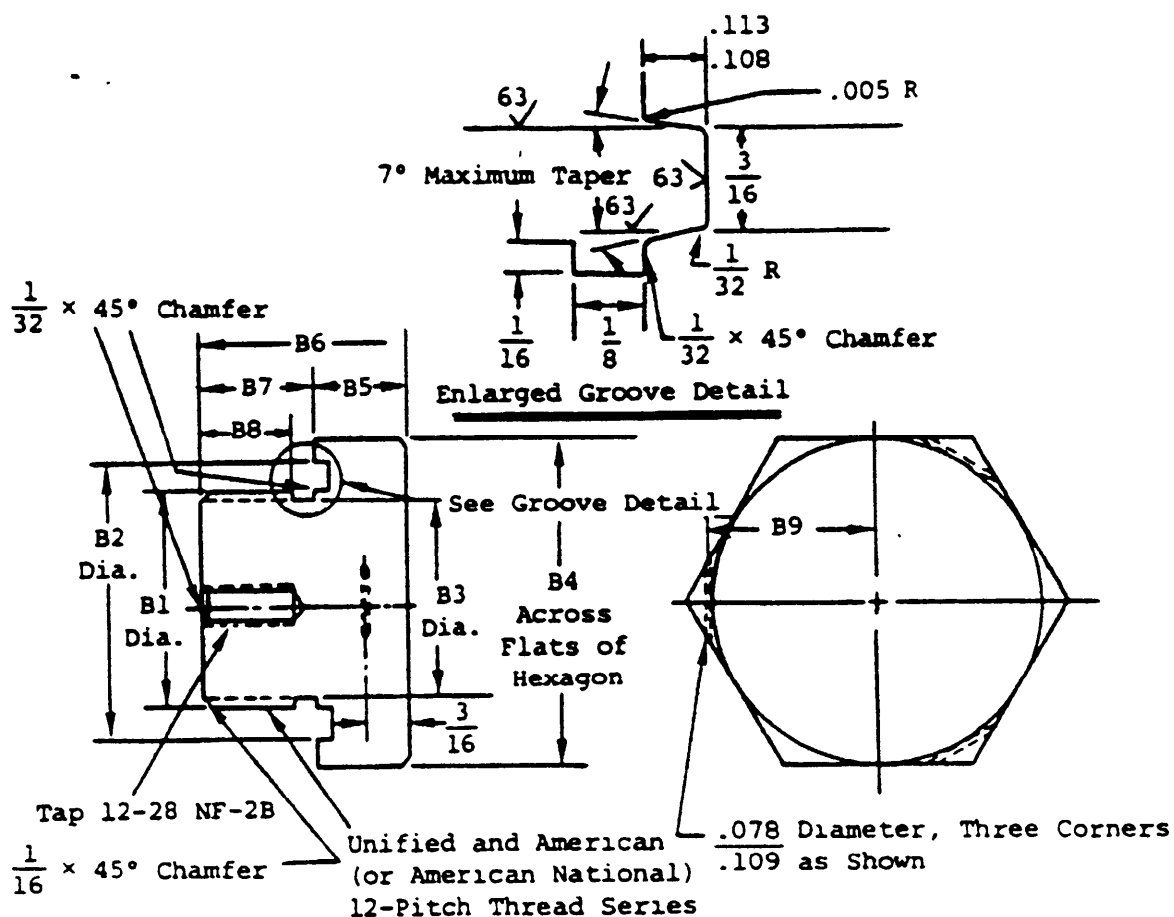
Solid zinc pencil		B	B1	B2	B3	B4	B5	B6	B7	B8	B9
Nps	od										
$\frac{3}{8}$	0.675	$\frac{3}{8}$	$1\frac{1}{16} - 12 \text{ UN}-2$	$1\frac{7}{16}$	$\frac{15}{16}$	$1\frac{11}{16}$	$\frac{1}{2}$	$1\frac{1}{8}$	$\frac{5}{8}$	$\frac{1}{2}$	$\frac{13}{16}$
$\frac{1}{2}$	0.840	$\frac{1}{2}$	$1\frac{5}{16} - 12 \text{ UN}-2$	$1\frac{11}{16}$	$1\frac{3}{16}$	$1\frac{15}{16}$	$\frac{1}{2}$	$1\frac{3}{8}$	$\frac{7}{8}$	$\frac{3}{4}$	$\frac{15}{16}$

## NOTES:

1. All fractional dimensions to have a tolerance of plus or minus  $\frac{1}{64}$  inch.
2. All dimensions are in inches.
3. The depth of the drill of the center hole in the support plug shall not result in a head which is less than  $\frac{3}{8}$  inch in thickness.

FIGURE 1. Class A, type I support plug for ZRN anode.

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Zinc coupon	B1	B2	B3	B4	B5	B6	B7	B8	B9
Diameter	External thread								
0.825	$1\frac{1}{16} - 12 \text{ UN}-2$	$1\frac{7}{16}$	$\frac{15}{16}$	$1\frac{11}{16}$	$\frac{1}{2}$	$1\frac{1}{8}$	$\frac{5}{8}$	$\frac{1}{2}$	$\frac{13}{16}$
1.050	$1\frac{5}{16} - 12 \text{ UN}-2$	$1\frac{11}{16}$	$1\frac{3}{16}$	$1\frac{15}{16}$	$\frac{1}{2}$	$1\frac{3}{8}$	$\frac{7}{8}$	$\frac{3}{4}$	$\frac{15}{16}$

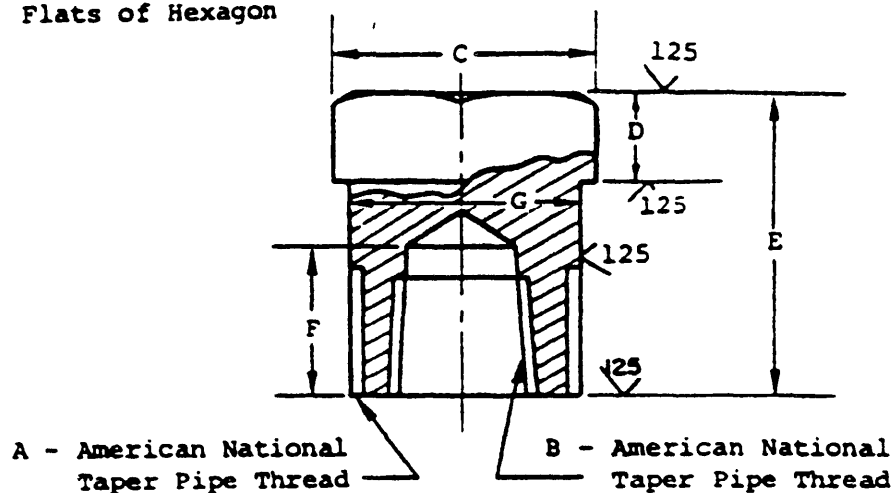
## NOTES:

1. All fractional dimensions to have a tolerance of plus or minus  $\frac{1}{64}$  inch.
2. All dimensions are in inches.
3. The depth of the drill of the center hole in the support plug shall not result in a head which is less than  $\frac{3}{8}$  inch in thickness.

FIGURE 2. Class A, type II support plug for ZDM anode.

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Maximum Width Across  
Flats of Hexagon



Nominal pipe size	A	B	C	D	E	F	G ±0.003	Actual diameter of zinc or iron rod anode
1	1	$\frac{1}{2}$	$1\frac{1}{2}$	$\frac{1}{2}$	$1\frac{3}{8}$	$\frac{7}{8}$	1.315	0.840
$\frac{3}{4}$	$\frac{3}{4}$	$\frac{3}{8}$	$1\frac{1}{4}$	$\frac{3}{8}$	$1\frac{1}{8}$	$\frac{5}{8}$	1.050	0.675
$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{8}$	1	$\frac{3}{8}$	1	$\frac{1}{2}$	0.840	0.405

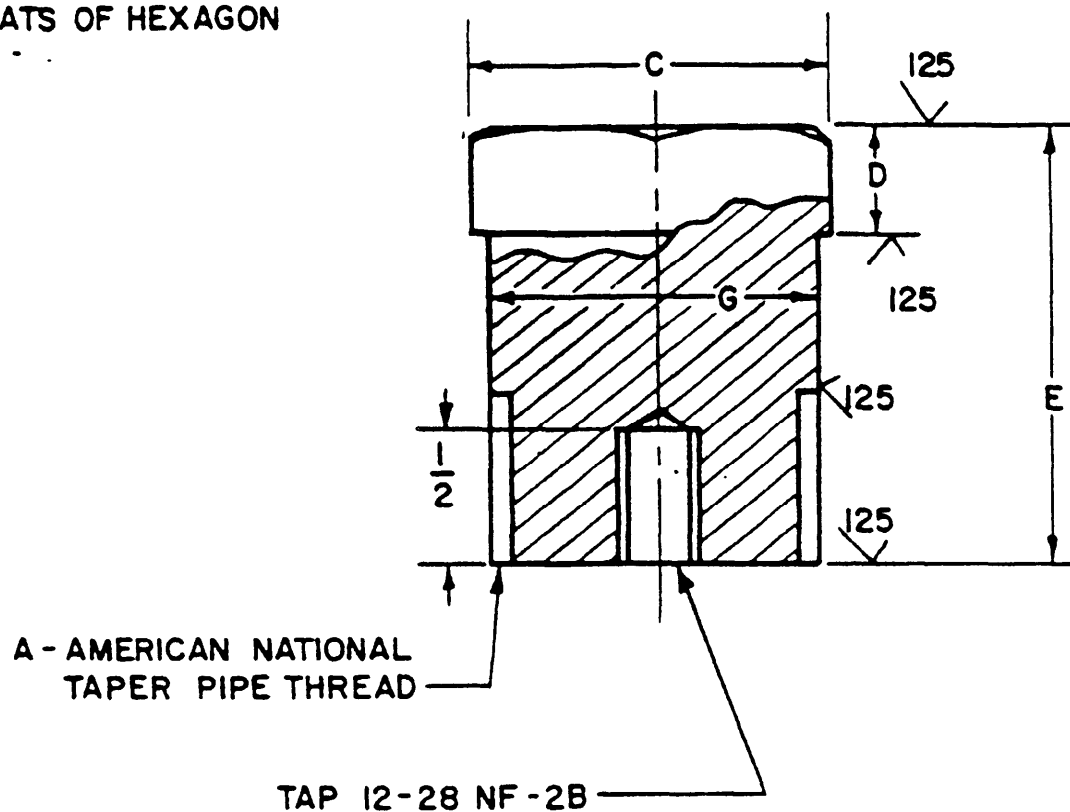
## NOTES:

1. All fractional dimensions to have a tolerance of plus or minus 1/64 inch.
2. All dimensions are in inches.
3. Class B support plugs are prohibited for use in new ships and are for replacement use only.

FIGURE 3. Class B, type I support plug for ZRN anode.

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# MAXIMUM WIDTH ACROSS FLATS OF HEXAGON



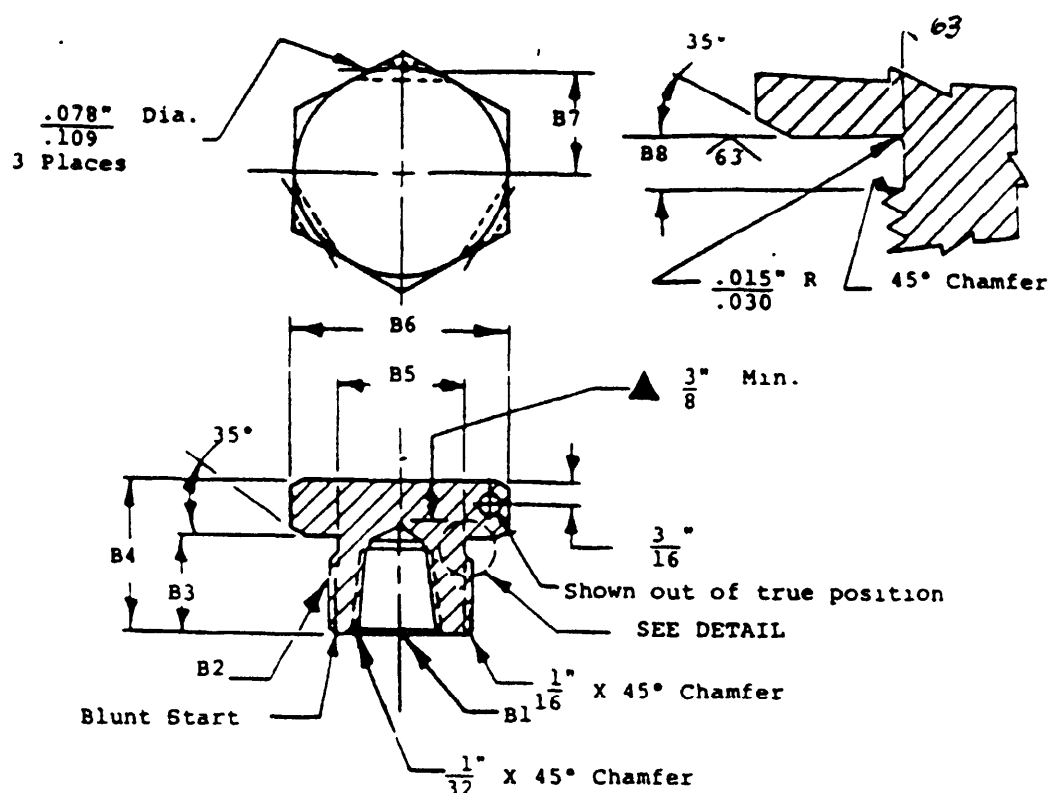
Nominal pipe size	A	C	D	E	G ±0.003	Actual diameter of zinc ZDM anode
1	1	1½	½	1⅜	1.315	1.050
¾	¾	1¼	⅜	1⅛	1.050	0.825
½	½	1	⅜	1	0.840	0.625
⅜	⅜	¾	⅝	1	0.675	0.500

## NOTES:

1. All fractional dimensions to have a tolerance of plus or minus 1/64 inch.
2. All dimensions are in inches.
3. Class B support plugs are prohibited for use in new ships and are for replacement use only.

FIGURE 4. Class B, type II support plug for ZDM anode.

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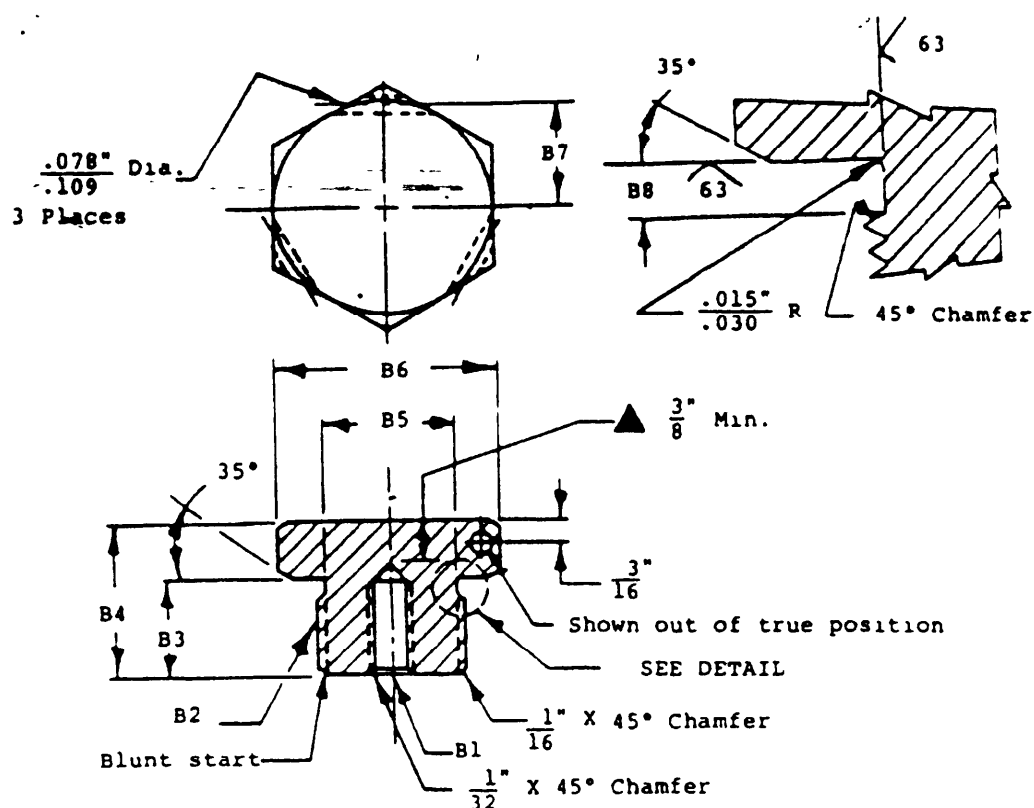
ANODE CD	B1	B2	B3	B4	B5	B6	B7	B8
.675	$\frac{3}{8}$ NPT	$1\frac{1}{16}$ - 12UN-2A	$.594^{+.005}_{-.005}$	$1\frac{3}{16}$	$.945^{+.002}_{-.000}$	$1\frac{1}{4}$	$\frac{5}{8}$	$.125^{+.015}_{-.000}$
.840	$\frac{1}{2}$ NPT	$1\frac{5}{16}$ - 12UN-2A	$.594^{+.005}_{-.005}$	$1\frac{1}{4}$	$1.195^{+.002}_{-.003}$	$1\frac{1}{2}$	$\frac{3}{4}$	$.125^{+.015}_{-.000}$

## NOTES:

1. All fractional dimensions to have a tolerance of plus or minus  $\frac{1}{64}$  inch.
2. All dimensions are in inches.
3. The depth of the drill of the center hole in the support plug shall not result in a head which is less than  $\frac{3}{8}$  inch in thickness.

FIGURE 5. Class C type I support plug for ZRN anode.

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ANODE OD	B1	B2	B3	B4	B5	B6	B7	B8
.825	12-28NF-2B	1 1/16-12UN-2A	.594 <sup>+.005</sup> <sub>-.005</sub>	1 3/16	.945 <sup>+.002</sup> <sub>-.000</sub>	1 1/4	5/8	.125 <sup>+.015</sup> <sub>-.000</sub>
1.050	12-28NF-2B	1 5/16-12UN-2A	.594 <sup>+.005</sup> <sub>-.005</sub>	1 1/4	1.195 <sup>+.002</sup> <sub>-.003</sub>	1 1/2	3/4	.125 <sup>+.015</sup> <sub>-.000</sub>

## NOTES:

1. All fractional dimensions to have a tolerance of plus or minus  $\frac{1}{64}$  inch.
2. All dimensions are in inches.
3. The depth of the drill of the center hole in the support plug shall not result in a head which is less than  $\frac{3}{8}$  inch in thickness.

FIGURE 6. Class C, type II support plug for ZDM anode.

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## APPENDIX

SELECTION AND INSTALLATION CRITERIA FOR ANODES IN  
HEAT EXCHANGERS

## 10. SCOPE

10.1 Scope. This appendix establishes the requirements for the application, determination of surface area and weight, and mounting configurations of corrosion prevention anodes in condensers and heat exchangers. This appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

## 20 APPLICABLE DOCUMENTS

This section is not applicable to this appendix.

## 30. REQUIREMENTS

30.1 Anode application criteria. The design of the cooling water side of copper or nickel alloy condensers and heat exchangers intended for use with salt water as a coolant shall provide for zinc or iron corrosion preventive anodes as a safeguard against galvanic corrosion. Iron alloy components shall be protected by zinc anodes.

30.1.1 Cored slab anodes. Cored slab anodes shall be used when space permits. The zinc anodes shall be type ZEP of MIL-A-18001. Standard sizes shall be used.

30.1.2 Pencil anodes. Pencil anodes may be used in intermediate and small size units where space will not permit the use of slab anodes or where it is necessary to supplement the anode surface area which can be provided by slab anodes, pencil anodes conforming to types ZRN or ZDM of MIL-A-18001 or iron anodes (carbon steel) AISI grade 1020 may be used. Lengths of all solid pencil anodes shall be multiples of 1/2-inch not to exceed 7 inches in length. The number of discs per pencil shall be suited to the installation, but shall not exceed seven.

30.1.2.1 Pencil anodes for intermediate size units. Intermediate size units are heat exchangers having more than 50 square feet of surface per tube bundle where space does not permit full protection from slab anodes. Solid pencils shall be made from 0.840 inch diameter zinc (ZRN rod) or carbon steel (see AISI 1020). Rods shall have a 1/2 inch taper pipe thread in accordance with FED-STD-H28 and FED-STD-H28/7 on one end for assembling to the plug. Multiple disc pencils shall use the 1.050 inch diameter type ZDM segmented disc zinc as specified in MIL-A-18001.

30.1.2.2.1 Pencil anodes for small size units. Small size units are heat exchangers having less than 50 square feet of surface per tube bundle. Solid pencils shall be made from a 0.675-inch diameter zinc or carbon steel (see AISI



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1020) rod, and shall have a 3/8-inch taper pipe thread in accordance with FED-STD-H28 and FED-STD-H28/7 on one end. Multiple disc pencils shall use a 0.825 inch diameter type ZDM segmented zinc disc in accordance with MIL-A-18001.

30.2 Anode surface and weight criteria. Zinc or iron anodes for each water box compartment shall be provided in accordance with the following formulae:

Zinc or iron surface for a water box compartment

$$Z = 0.078 (0.75D^2 + 6Nd^2)$$

Where:

- Z = Surface needed, in square inches.
- D = Diameter of a circle of area equal to exposed face of tube sheet, in inches. (This area shall be calculated as though the sheet had not been drilled for tubes.)
- N = Number of tube ends exposed in the compartment.
- d = Inside diameter of the tubes, in inches.

Weight for a water box compartment

$$W = 0.046Z$$

Where:

- W = Weight of zinc or iron needed, in pounds.
- Z = Surface needed, as computed above in square inches.

30.2.1 Computing zinc slab surface. In computing zinc slab surface, the back face of the zinc (adjacent to the surface of the water box) shall not be counted. The surface of the edges of the slab may be counted in designs where the zinc is not recessed to obtain a faired surface along the inside of the compartment. That part of the outer face of the zinc which is covered by the nut shall be disregarded.

30.2.2 Computing surface of solid pencil. In computing surface of the solid pencil, the ends shall be disregarded. The cylindrical surface of a solid pencil for a distance of 1/2-inch from the threaded end shall be disregarded. Only the exposed cylindrical surface shall be used.

30.2.3 Computing surface of segmented disc pencils. In computing the surface of the segmented disc pencils, only the exposed cylindrical surface shall be used.

30.3 Anode mounting requirements. The anodes shall be installed in such a way as to permit ready disassembly from the unit for examination, cleaning, or replacement without removal of the water box. When more than one anode is required in a compartment, the anodes shall be well distributed throughout the compartment. Anodes shall be arranged so as to create a minimum of turbulence in the water flow.

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30.3.1 Cored slab anodes. Cored slab anodes shall be mounted on removable covers when water boxes are not fitted with a manhole. If a manhole is provided, the manhole cover and other access opening covers shall be fitted with zinc slabs to the extent necessary to fulfill requirements; when such covers are unable to carry the required amount of zinc, the remainder may be mounted on the interior of the compartment. Slabs shall be mounted on a boss (or bosses) and secured by a 1/2 inch diameter stud (or studs) and two ~~semifinished~~ regular jam nuts per stud conforming to MIL-S-1222. The stacking of more than one anode on a support is not acceptable.

30.3.2 Pencil anodes for new designs on surface ships. Pencil anodes for new design on surface ships may be mounted in threaded support plugs, class A or C, type I or II, only if space limitations prevent their being supported by nonwetted bolted closures. Pencil anodes for intermediate size units shall be mounted in 1-5/16 inch thread diameter plugs. Pencil anodes for small size units shall be mounted in 1-1/16 inch diameter plugs.

30.3.3 Pencil anodes for submarine applications. Pencil anodes for submarine applications shall be as follows: Only non-wetted bolted closures may be used to retain zinc anodes for new design submarine components exposed to submergence pressure where space does not permit installation of internal zinc slabs. For non-submergence pressure applications, threaded anode plugs in accordance with NAVSEA Drawing 803-5959186 may only be considered if space limitations prevent mounting pencil anodes on non-wetted bolted closures or installing slabs by removable covers.

30.3.4 Pencil anode support plugs for reactor plant components. Pencil anode support plugs for reactor plant components must also meet the requirements of NAVSEA Drawing 803-4385176.

# STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

## INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

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<b>1 RECOMMEND A CHANGE:</b>		<b>1 DOCUMENT NUMBER</b> MIL-A-19521B(SH)	<b>2 DOCUMENT DATE (YYMMDD)</b> 92/05/04
<b>3. DOCUMENT TITLE</b> ANODE RETAINING SUPPORT PLUGS AND ANODE SELECTION AND INSTALLATION DESIGN CRITERIA FOR SHIPBOARD CONDENSERS AND HEAT EXCHANGERS			
<b>4. NATURE OF CHANGE</b> (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)			
<b>5. REASON FOR RECOMMENDATION</b>			
<b>6. SUBMITTER</b>			
<b>a. NAME (Last, First, Middle Initial)</b>		<b>b. ORGANIZATION</b>	
<b>c. ADDRESS (Include Zip Code)</b>		<b>d. TELEPHONE (Include Area Code)</b> (1) Commercial (2) AUTOVON (If applicable)	<b>7. DATE SUBMITTED (YYMMDD)</b>
<b>8. PREPARING ACTIVITY</b>			
<b>a. NAME</b> Technical Point of Contact (TOPC): Mr. Bill Austen (SEA 56X23) PLEASE ADDRESS ALL CORRESPONDENCE AS FOLLOWS:		<b>b. TELEPHONE (Include Area Code)</b> (1) Commercial (2) AUTOVON TPOC: 703-602-8818 8-332-8818	
<b>c. ADDRESS (Include Zip Code)</b> Commander, Naval Sea Systems Command Department of the Navy (SEA 5523) Washington, DC 20362-5101		<b>IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:</b> Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340	