

W-R-550A  
June 12, 1975  
SUPERSEDING  
(See 6.4)

## FEDERAL SPECIFICATION

### ROD, GROUND (WITH ATTACHMENTS)

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

#### 1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers grounding electrodes with connecting cables and provisions for securing attachments to exposed noncurrent-carrying conductive materials of electrical equipment in mobile shops, temporary or permanent power stations, temporary substations and to establish grounds in areas devoid of underground water-piping systems or equivalent.

#### 1.2 Classification.

1.2.1 Types and classes. The ground rods covered by this specification shall be of the following types and classes (see 6.2):

- Type I - Auger Rod (Figure 1).
  - Class A - Galvanized.
- Type II - Driven Rod (Figure 2).
  - Class A - Galvanized.
  - Class B - Copper-cladding.
- Type III - Sectional Rod (Figure 3).
  - Class B - Copper-cladding.
- Type IV - Driven Head (Figure 4).
  - Class A - Galvanized.

#### 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:

FSC 5975

W-R-550A

Federal Specifications:

- |          |   |  |
|----------|---|--|
| W-C-440  | - | Clip, Electrical, General Specification for.           |
| QQ-S-634 | - | Steel, Bar, Carbon, Cold Finished, (Standard Quality). |

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, US Government Printing Office, Washington, DC 20402.)

(Single copies of this specification and other Federal Specifications required by activities outside the Federal Government for bidding purposes are available without charge from Business Service Centers at the General Services Administration Regional Offices in Boston, New York, Washington, DC, Atlanta, Chicago, Kansas City, MO, Fort Worth, Denver, San Francisco, Los Angeles, and Seattle, WA.)

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies.)

Military Specification:

- |             |   |   |
|-------------|---|---|
| MIL-E-17555 | - | Electronic and Electrical Equipment, Accessories, and Repair Parts; Packaging and Packing of. |
|-------------|---|---|

Military Standards:

- |             |   |  |
|-------------|---|--|
| MIL-STD-105 | - | Sampling Procedures and Tables for Inspection by Attributes. |
| MIL-STD-130 | - | Identification Marking of US Military Property.              |

(Copies of Military Specifications and Standards required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

W-R-550A

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

National Bureau of Standards (NBS) Handbook

    HZ8 - Screw-Threaded Standards for Federal Services.

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

American Welding Society, Inc.

    DL 1 - Structural Welding Code, Section 5, Qualification.

(Application for copies should be addressed to the American Welding Society, Inc., 2501 N. W., Seventh Street, Miami, FL 33125.)

National Fire Protection Association (NFPA):

    NFPA No. 70 - National Electrical Code.

(Application for copies should be addressed to the National Fire Protection Association, 60 Batterymarch Street, Boston, MA 02110.)

American Society for Testing and Materials (ASTM) Standards:

    A153 - Zinc-Coating (Hot-Dip) or Iron and Steel Hardware, Specification for

    B152 - Copper Sheet, Strip, Plate, and Rolled Bar.

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

Underwriters Laboratories, Inc. (UL) Standard:

    UL - 467 - Grounding and Bonding Equipment.

(Application for copies should be addressed to the Underwriters Laboratories, Inc., 207 East Ohio Street, Chicago, IL 60611; 333 Pfingsten Road, Northbrook, IL 60062; 1285 Walt Whitman Road, Melville, L.I., NY 11746; or 1655 Scott Boulevard, Santa Clara, CA 95050.)

W-R-550A

### 3. REQUIREMENTS

3.1 Description. The ground rod assemblies shall be in accordance with NFPA Code No. 70 and as shown on the applicable figure and as specified herein.

3.2 First article (production model). The supplier shall furnish one or more ground rod assemblies of those types and classes specified (see 6.2), for examination and testing within the time frame specified (see 6.2) to prove prior to starting production that his production methods and choice of design detail will produce ground rod assemblies that comply with the requirements of this specification. Examination and tests shall be as specified in Section 4 and shall be subject to surveillance and approval by the Government (see 6.3).

3.3 Material. Material shall be as specified herein and as shown on the applicable figures. Materials not specified shall be selected by the supplier and shall be subject to all provisions of this specification.

3.3.1 Threads. All threaded parts required in the construction of rod assemblies shall be in the inch system and shall comply with Handbook H28.

3.3.2 Straightness. Ground rods shall be straight with a maximum tolerance of 1/8 inch depth of arc, extending 5 linear feet of rod length.

3.3.3 Class A rods. Class A rods shall be fabricated of steel conforming to QQ-S-634, Grade 1025 and shall have a hardness of Rockwell B 74 to 82. The rod shall be galvanized conforming to ASTM A153, Class A, depth not less than 0.0034 inch.

3.3.4 Class B rods. Class B rods shall be fabricated from steel conforming to QQ-S-634, Grade 1018 and shall have a hardness of Rockwell B 92 to 100 with a copper cladding of not less than 0.010 inches conforming to ASTM B152.

3.4 Protective finishes. Exposed metal surfaces, except when parts are inherently corrosion resistant, shall be finished to resist corrosion.

3.5 Type I rod. The Type I rod shall be 8 feet long +/- 1 inch, shall be not less than 5/8 inch in diameter and shall consist of a steel rod with an auger tip for ground insertion on one end and "T" handle on the other end (see Figure 1). The T-handle shall be of steel and shall be attachable to the grounding portion of the rod at a point equidistance both ends of the handle. The auger tip shall be of steel with a right-hand thread not less than 9 inches in length. The ratio of the pitch diameter to the major diameter of the flutes shall be approximately 1.4 to 1. The auger tip shall be integral with the rod or attached thereto by means of brazing or welding. The tip shall be heat-treated to a minimum hardness of 45 Rockwell C (see Figure 1).

W-R-550A

3.6 Type II. Class A or Class B rods. The Type II rod shall be 8 feet  $\pm$  5/8 inch long, 5/8  $\pm$  0 -5/64 diameter or 8 feet  $\pm$  3/4 inch long, 5/8  $\pm$  0 -5/64 inch diameter or 10 feet long  $\pm$  1 inch and 3/4 inch  $\pm$  0 -5/64 diameter as specified (see 6.2). These rods shall have a conical end for ground insertion and a flat end with a chamfer as shown in Figure 2. The ground insertion end shall be pointed without application of heat, so as to retain original hardness of the metal (see 3.3.3 and 3.3.4). The conical point angle shall be 60 degrees, with a tolerance of  $\pm$  5 degrees. The chamfer shall be 30 degrees (see Figure 2).

3.7 Type III, Class B rods. The Type III rod shall have three 3 foot  $\pm$  3/8 inch sections 5/8 inch  $\pm$  0 -5/64 diameter or four 5 foot  $\pm$  3/4 inch sections 3/4 inch  $\pm$  0 -5/64 diameter or two 5 foot  $\pm$  3/4 inch sections 3/4 inch  $\pm$  0 -5/64 diameter as specified (see 6.2).

3.8. Type IV, Class A rod. The Type IV rod shall be 8 feet  $\pm$  1/2 inch long 5/8 inch  $\pm$  0 -5/64 diameter and shall conform to Figure 4.

3.9 Fastening devices. All screws, pins, bolts, and similar parts shall be installed with means for preventing loss of tightness and adjustment.

3.10 Clamp. The clamp shall permit installation on the ground rod before or after the rod is inserted into the ground. Clamp body and parts shall have material compatible with the class of rod to preclude electrolytic corrosion.

3.10.1 Type I clamp. The clamp for Type I rod (see Figure 1) shall consist of a U-shaped yoke to accommodate a crossbar containing a threaded hole. A hexagonal-headed bolt to fit the threaded hole shall be used to apply pressure to the contact plate and clamp, producing a positive electrical connection without overstressing the material. Minimum size of the bolt shall be 5/16 inch. The minimum thickness of the clamp body shall be 1/8 inch.

3.10.2 Type II and Type III clamp. The clamp for the Type II and Type III rod (see Figures 2 and 3), shall be of a one-piece assembly with a threaded hole and a square head cup setscrew of 1/2 inch minimum diameter. The clamp shall be of sufficient size to allow it to be fitted over the ground rod and, when mounted in place, shall provide a positive electrical connection with the rod and grounding cable.

3.10.3 Type IV clamp. The clamp for the Type IV rod shall conform to Figure 4 and the shoulder thumbscrew and washer shall be 1/2 inch diameter with 20 threads per inch.

W-R-550A

3.11 Ground cable. Unless otherwise specified (see 6.2) the overall cable length shall be 6 feet +/- 1 inch.

3.11. Type I grounding cable. Grounding cable for Type I shall consist of No. 10 American Wire Gage (AWG), rope stranded (7 strands), extra flexible bare copper wire or a strap of braided or woven copper wire equivalent to No. 6 AWG. A strap, if supplied shall be not less than 3/4 inch, not more than 1 inch wide. The wire or braid shall be coated with tin, lead, or lead alloy, one end being soldered or brazed to the yolk of the U-clamp and the opposite end attached to the power clip (see Figure 1).

3.11.2 Type II, Type III, and Type IV grounding cable. Grounding cable for Type II, Type III, and Type IV rods shall consist of No. 6 AWG flexible bare stranded copper wire.

3.12 Ground terminal.

3.12.1 Type I grounding terminal. The ground terminal clip for Type I rods (see Figure 1) shall conform to W-C-440, Type PC.

3.12.2 Type II, Type III, and Type IV grounding terminal. The ground terminal lug for Types II, III, and IV (see Figures 2, 3, and 4) shall be internal pressure bar type containing a threaded hole fitted with a filister head machine screw for tightening against the pressure bar. The terminal shall provide electrical contact with the cable without deformation or weakening of the connection. A flattened portion shall be provided on the terminal and shall have minimum dimensions of 1/2 inch long by 1/2 inch wide by 1/16 inch thick. This portion shall include a hole 9/32 inch +/- 1/32 inch diameter.

3.13 Impact strength. When tested as specified in 4.6.1, the ground rod shall not shatter, become deformed, or otherwise physically damaged.

3.14 Bending. When tested as specified in 4.6.2, the ground rod shall show no evidence of cracking of the outside surface of the bent portion.

3.15 Contact resistance. When tested as specified in 4.6.4, the contact resistance between the terminal connection and the ground rod shall not exceed 0.005 ohm.

3.16 Identification markings. The ground rod shall be identified by etching, engraving, or metal stamping in accordance with MIL-STD-130. The marking shall be located 6 inches from the top of the rod (clamp end).

W-R-550A

3.17 Workmanship. All ground rods and component accessories shall be free of burrs and sharp edges. Welds shall be free of fissures and lack of fusion with the parent metals. Metal coatings shall be not less than specified herein and shall be free of pits and voids.

#### 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 in the contract or order, the supplier 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 performance of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Classification of inspections. Inspections shall be classified as follows:

- (a) Preproduction model inspection (see 4.3).
- (b) Quality conformance inspection (see 4.4).
- (c) Inspection of preparation for delivery (see 4.7).

#### 4.3 Preproduction model inspection.

4.3.1 Examination. Each preproduction ground rod shall be examined in accordance with 4.5.1. Presence of one or more defects in either ground rod assembly shall be cause for rejection.

4.3.2 Tests. Following successful completion of the examination, the preproduction ground rods shall be subjected to the tests marked "X" in column 1 of Table I. Failure of as test shall be cause for rejection.

#### 4.4 Quality conformance inspection.

4.4.1 Sampling. Sampling for examination and test shall be in accordance with MIL-STD-105, Inspection Level III.

#### 4.4.2 Examination.

4.4.2.1 Samples. Samples selected in accordance with 4.4.1 shall be examined for defects specified in 4.5.1. AQL shall be 2.5 percent defective.

W-R-550A

## 4.4.3 Tests.

4.4.3.1 Samples. Samples selected in accordance with 4.4.1 shall be tested as specified in Column 3 of Table I. AQL shall be 2.5 percent defective.

## 4.5 Inspection procedure.

4.5.1 Examination. The rod shall be examined as specified herein for the following defects:

- 101. Dimensions not as specified.
- 102. Absence of any part or component.
- 103. Misalignment of parts or component.
- 104. Materials or components not as specified.
- 105. Absence or incorrectness of identification markings.
- 106. Workmanship not as specified.

## 4.5.2 Tests.

## 4.5.2.1 Test schedule.

Table I. Test Schedule

Preproduction	Quality Conformance		Test	Test Paragraph	Requirement Paragraph
	Individual	Sample			
X	-	X	Clamp.	4.6.3	3.10.1 3.10.2 3.10.3
X	-	X	Impact strength.	4.6.1	3.13
X	-	X	Bending.	4.6.2	3.14
X	-	X	Contact resistance.	4.6.4	3.15

## 4.6 Test procedures.

4.6.1 Impact strength. With the ground rod in a vertical position and securely held in place by mean of a suitable device placed 6 inches from the drive end of the rod, a 4 pound weight shall be dropped on the drive end of the rod 25 consecutive times. The weight shall be dropped from a height of not less than 10 feet above the drive end of the rod. After completion of the test, failure of the rod to meet the requirements of 3.13 shall constitute failure of this test.



W-R-550A

4.6.2 Bending. The ground rod shall be subjected to a cold-bending test at a temperature of 77 deg. F +/- 9 deg. F. The rod shall be held in a suitable rigid clamp or vise and the free end bent by applying a force normal to the rod at a distance of 40 rod diameters +/- 1/32 inch from the clamping device. The normal force shall be applied until a permanent angular bend of 30 degrees is achieved by the rod. Failure of the rod to meet the requirements of 3.14 shall constitute failure of this test.

4.6.3 Clamp. The clamp, with grounding cable and terminal, shall be attached to the ground rod and the cable pulled for 5 minutes with a pull of not less than 150 pounds in a direction that is parallel to the axis of the rod. Slippage of the clamp or cable shall constitute failure of this test.

4.6.4 Contact resistance. The contact resistance between the terminal connection and the rod shall be measured on a Wheatstonebridge, or other suitable measuring circuit to determine compliance with the requirements of 3.15. Failure to meet the requirements of 3.15 shall constitute failure of this test.

4.7 Inspection of preparation for delivery. The preservation, packaging, and packing shall be examined and tested, and the marking shall be examined to determine if any marking is missing, illegible, incorrect, or incomplete in accordance with the Quality Assurance Provisions of the referenced document in Section 5 of this specification.

## 5. PREPARATION FOR DELIVERY

5.1 Preservation, packaging, packing and marking. Each complete rod shall be preserved, packaged, packed, and marked in accordance with MIL-E-17555 with the following exception: Fiberboard containers are not acceptable for Level A packing. Preservation and packaging shall be Level A, B, or C, as specified (see 6.2).

## 6. NOTES

6.1 Intended use. The ground rod is intended to be used as a safety device to minimize the possibility of injury to personnel and reduce fire hazards by providing a temporary connection for grounding exposed, noncurrent carrying conductive materials of electrical equipment. The Type I rod provides a temporary connection for grounding the body or frame of mobile shops and electrical equipment, and Type II rods provide a temporary installation for signal lines, power stations and substations.

W-R-550A

6.2 Ordering data. Purchasers should select the preferred options permitted herein, and include the following information in procurement documents:

- (a) Title, number and date of this specification.
- (b) Type and class of rod required (see 1.2.1).
- (c) Time frame required for submission of preproduction model (see 3.2).
- (d) When the Government will conduct any or all of the preproduction model examination and tests. When the Government will conduct some but not all of the preproduction examination and tests, the contracting officer should specify which examination and tests will be conducted by the Government and which examination and test shall be conducted by the supplier (see 3.2).
- (e) Length of rod required (see 3.6 and 3.7).
- (f) Length of ground cable if other than specified (see 3.11).
- (g) Level of preservation, packaging, packing, and marking (see 5.1).

6.3 Preproduction model. Any changes or deviations of production ground rods from the approved preproduction model during production will be subject to the approval of the contracting officer. Approval of the preproduction model will not relieve the supplier of his obligation to furnish ground rods conforming to this specification.

6.4 Supersession data. This specification supersedes W-R-00550 (GSA-FSS) dated December 4, 1963 MIL-R-114610 dated 12 July 1963, and MIL-R-12644A (EL) dated 16 March 1967.

6.5 Classification relationship. The relationship between classification of ground rods included in this revision of the specification and the superseded documents is as follows:

<u>W-R-550A</u>	<u>W-R-00550 (GSA-FSS)</u>	<u>MIL-R-11461C</u>	<u>MIL-R-12644A (EL)</u>
Type I, Class A	None	Type I	None
Type II, Class A and B	Yes [1]	Type II, style 1	None
Type III, Class B	None	Type II, style 2	None
Type IV, Class A	None	Type II, style 3	MX-148/G

[1] Similar, but without clarification.

W-R-550A

MILITARY INTERESTS:

Civil Agency Coordinating Activity:

Custodians:

GSA - FSS

GSA - FSS

Army - ME

Navy - YD

Air Force - 85

DOD Project No. 5975-0430

Review Activities:

Army - EL

Air Force - 80, 11

User Activity:

Preparing activity:

Army - WC

Army - CL

---

Orders for this publication are to be placed with General Services Administration, acting as an agent for the Superintendent of Documents. See Section 2 of this specification to obtain extra copies and other documents referenced herein. Price 40 cents each.

W-R-550A

W-R-550A

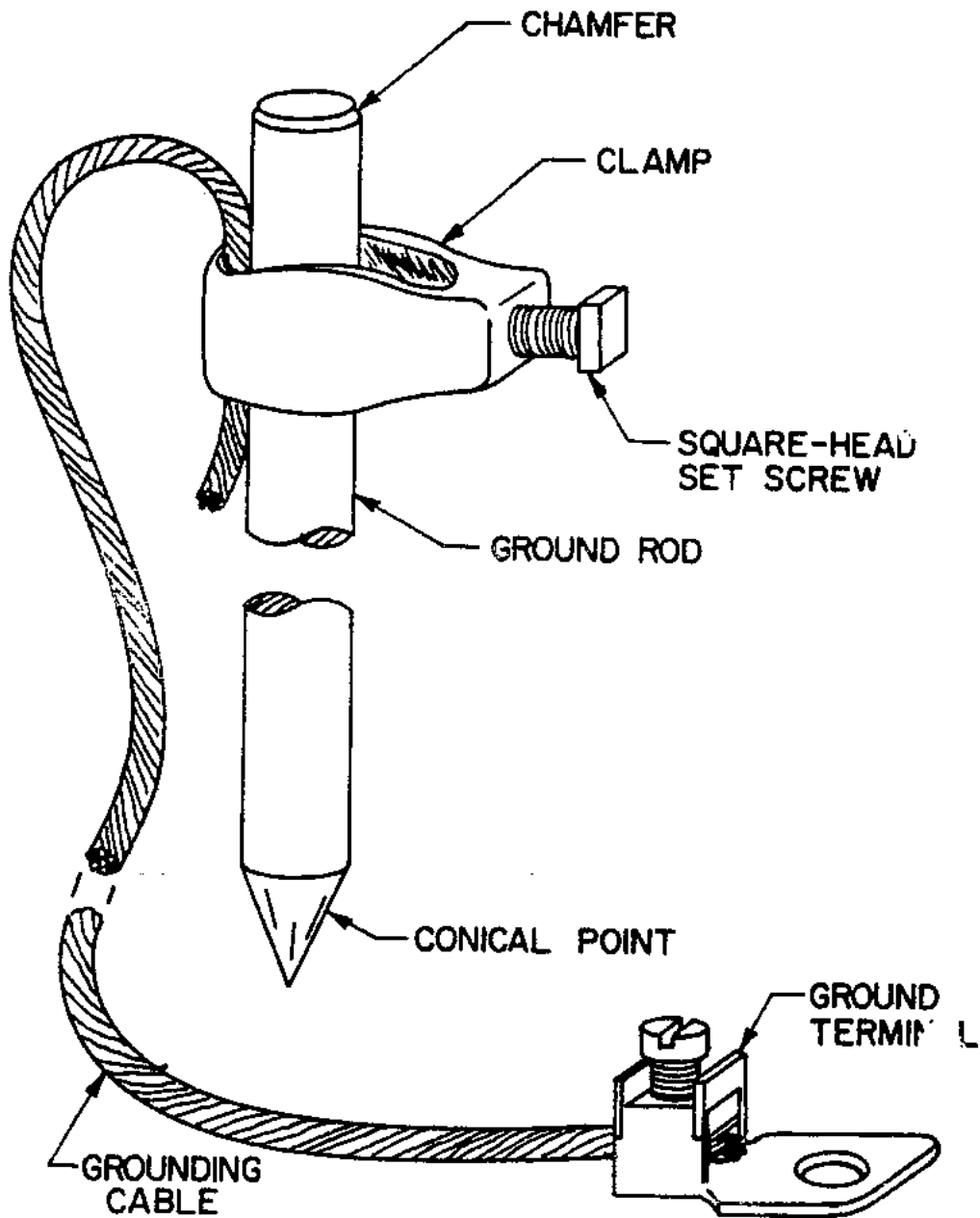


Figure 2. TYPE II, CLASS A OR B,  
DRIVEN ROD

BX1882A

W-R-550A

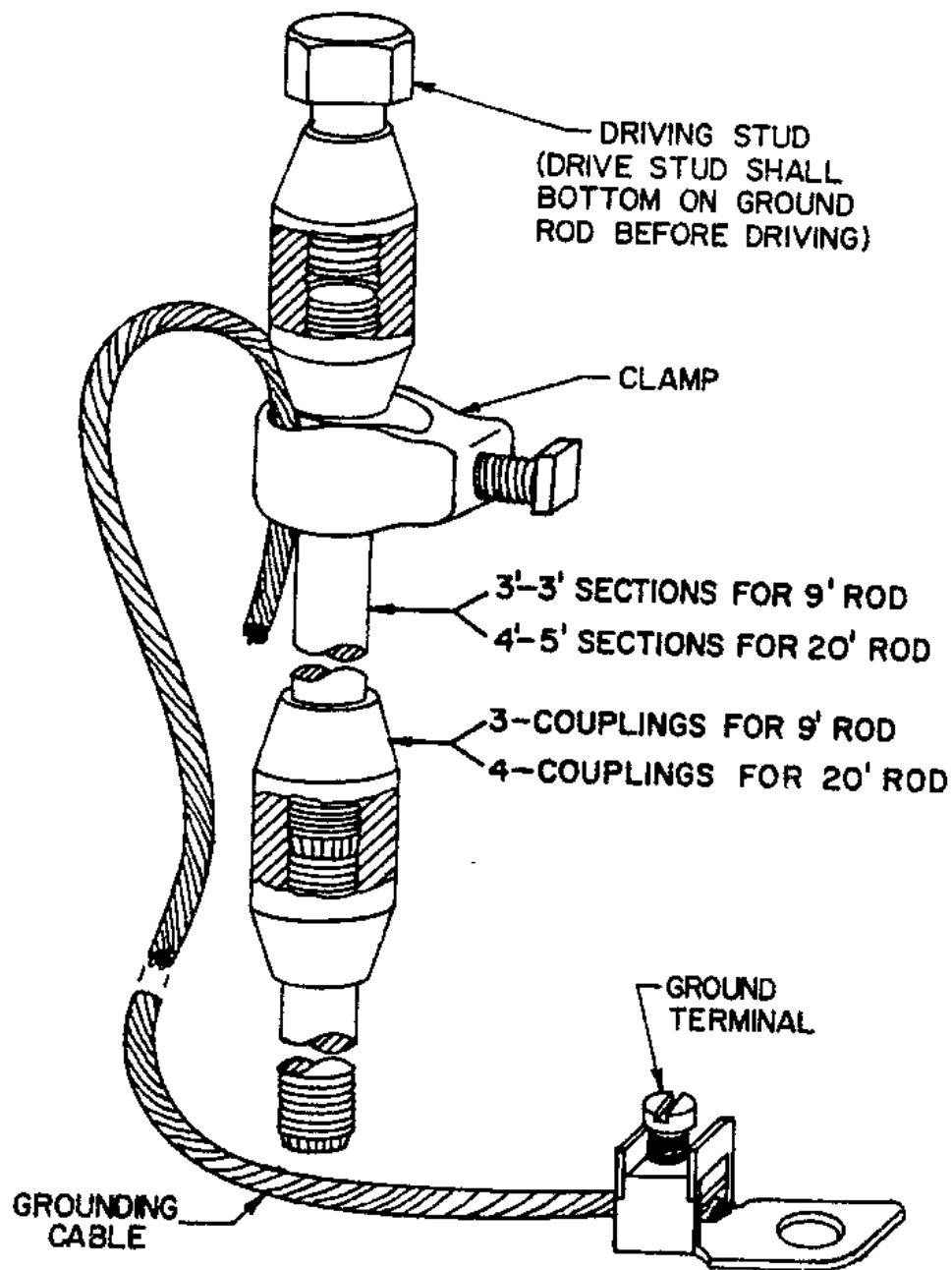


Figure 3. TYPE III CLASS B, SECTIONAL ROD

BX1883A

W-R-550A

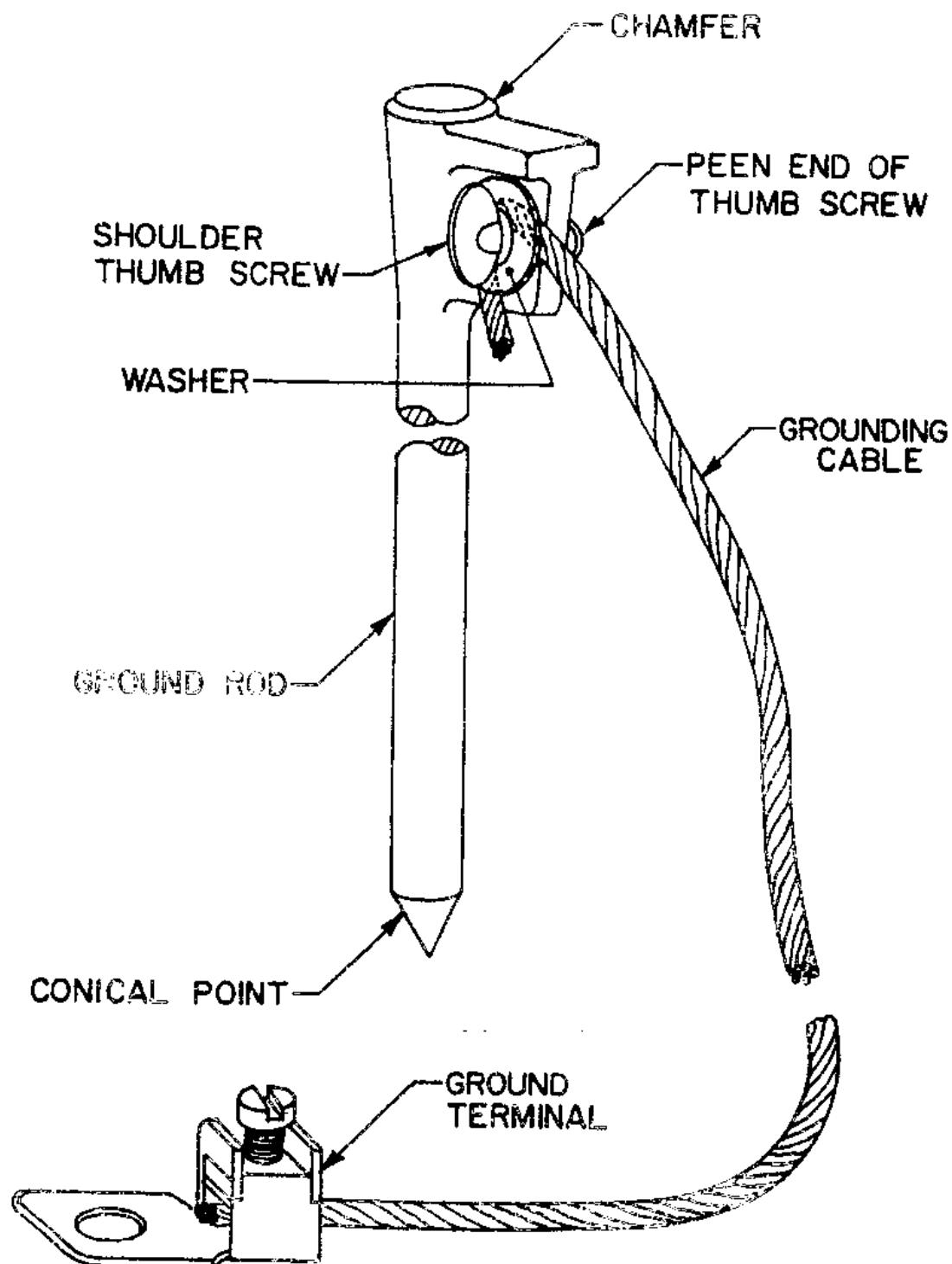


Figure 4. TYPE IV CLASS A, DRIVE HEAD ROD

BX1684B

W-R-550A  
AMENDMENT-1  
August 18, 1977

FEDERAL SPECIFICATION

ROD, GROUND (WITH ATTACHMENTS)

This amendment, which forms a part of Federal Specification W-R-550A, dated June 12, 1975, was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

PAGE 2

2.1, under Federal Specification, delete:

"QQ-S-634                      - Bar, Carbon, Cold Finished, Standard  
Quality."

2.1, under Military Standards, delete:

"MIL-STD-130                - Identification Marking of US Military  
Property."

PAGE 3

2.2, under American Society for Testing and Materials, add:

"A108 - Steel Bars, Carbon, Cold Finished, Standard Quality."

PAGE 4

After 3.3.1, add:

"3.3.1.1 Threads for the Type III, Class B rods. The Type III rods shall have 5/8-II-UNC-2A or 3/4-IO-UNC-2A threads as specified. The coupling shall be in accordance with Figure 5."

3.3.3, line 2, after "to" delete "QQ-S-634J Grade 1025" and substitute "ASTM A108, Grade 1020, 1022, or 1025."

3-3.4, line 2, after "to", delete "QQ-S-634" Grade 1018" and substitute "ASTM A108, Grade 1016, 1018, or 1020."; second sentence, after "B", delete "92" and substitute "90".

3.10.2, line 3, delete "SQUARE" and substitute "HBX".

PAGE 6

3.16, delete in its entirety.

FSC 5975

W-R-550A  
AMENDMENT-1

PAGE 7

4.4.1, after "MIL-STD-105", change comma to period; delete "Inspection Level III" and add the following sentence:

"The inspection level for examination shall be Level II, and the inspection level for tests shall be Level S-3."

4.4.2.1, delete second sentence and substitute:

"AQL for examination shall be 4.0 percent defective and AQL for tests shall be 1.5 percent defective."

PAGE 8

TABLE I. TEST SCHEDULE, add under column headings:

PREPRODUCTION	QUALITY CONFORMANCE		TEST	TEST PARAGRAPH	REQUIREMENT PARAGRAPH
	INDIVIDUAL	SAMPLE			
" X	1	X	Copper	4.6.5	3.3.4"

PAGE 9

Add 4.6.5:

"4.6.5 Thickness of copper cladding. The thickness of the copper cladding on Class B rods shall be measured with an elecometer thickness gage, Type B, thickness not in accordance with 3.3.4 shall constitute failure of test and shall be cause for rejection."

PAGE 11

Delete "GL" as preparing activity and substitute "ME".

PAGE 13

Figure 2, delete "SQUARE-HEAD" and substitute "HEX-HEAD"; show set screw as hex-head.

PAGE 14

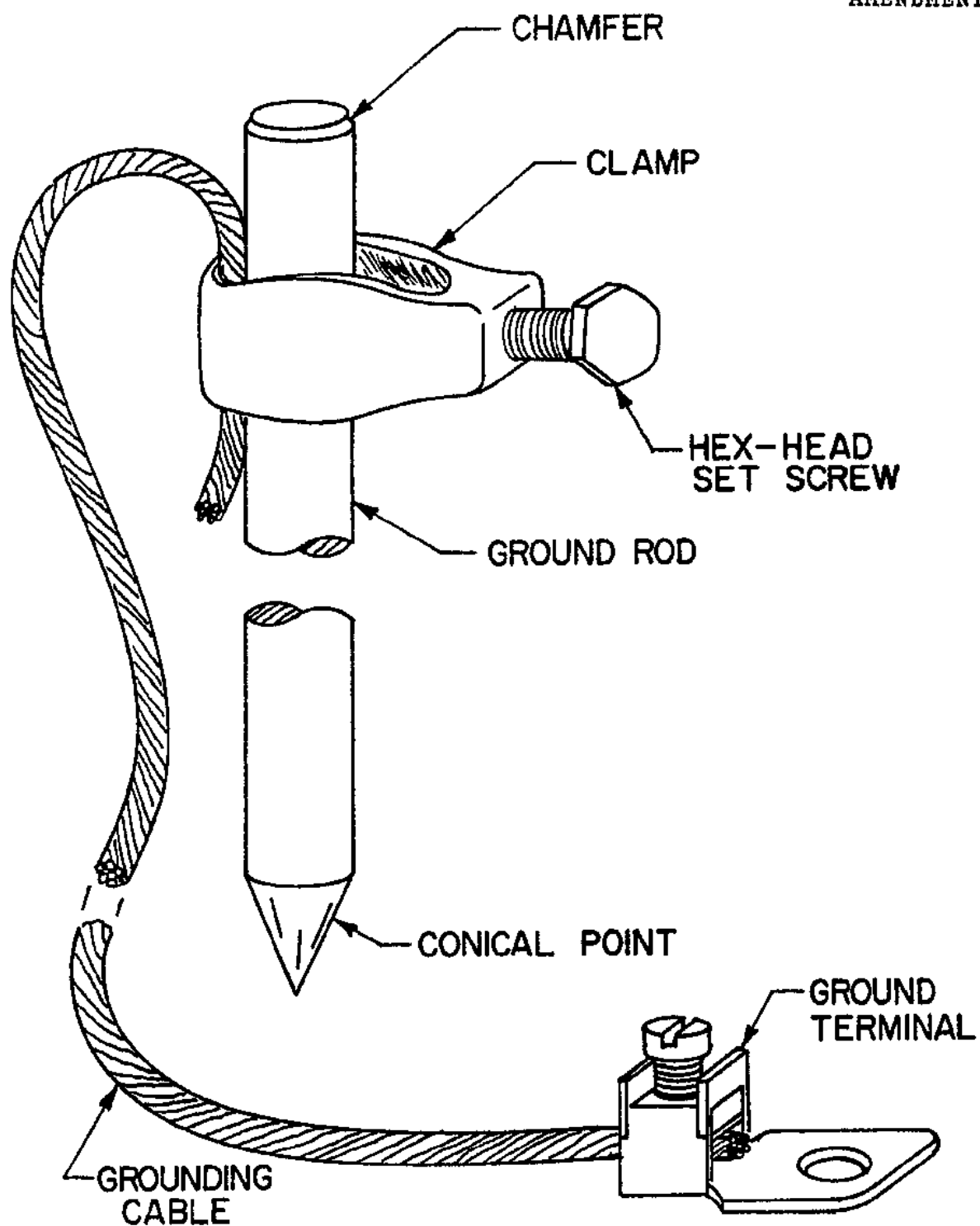
Figure 3, show set screw as hex-head; add: "2-5' sections for 10' rod"; add: "2-couplings for 10' rod".

Add Figure 5.



W-R-550A  
AMENDMENT-1

W-R-550A  
AMENDMENT 1



**FIGURE 2. Type II, Class A or B, driven rod.**

**X-1882B**

W-R-550A  
AMENDMENT-1

W-R-550A  
AMENDMENT-1

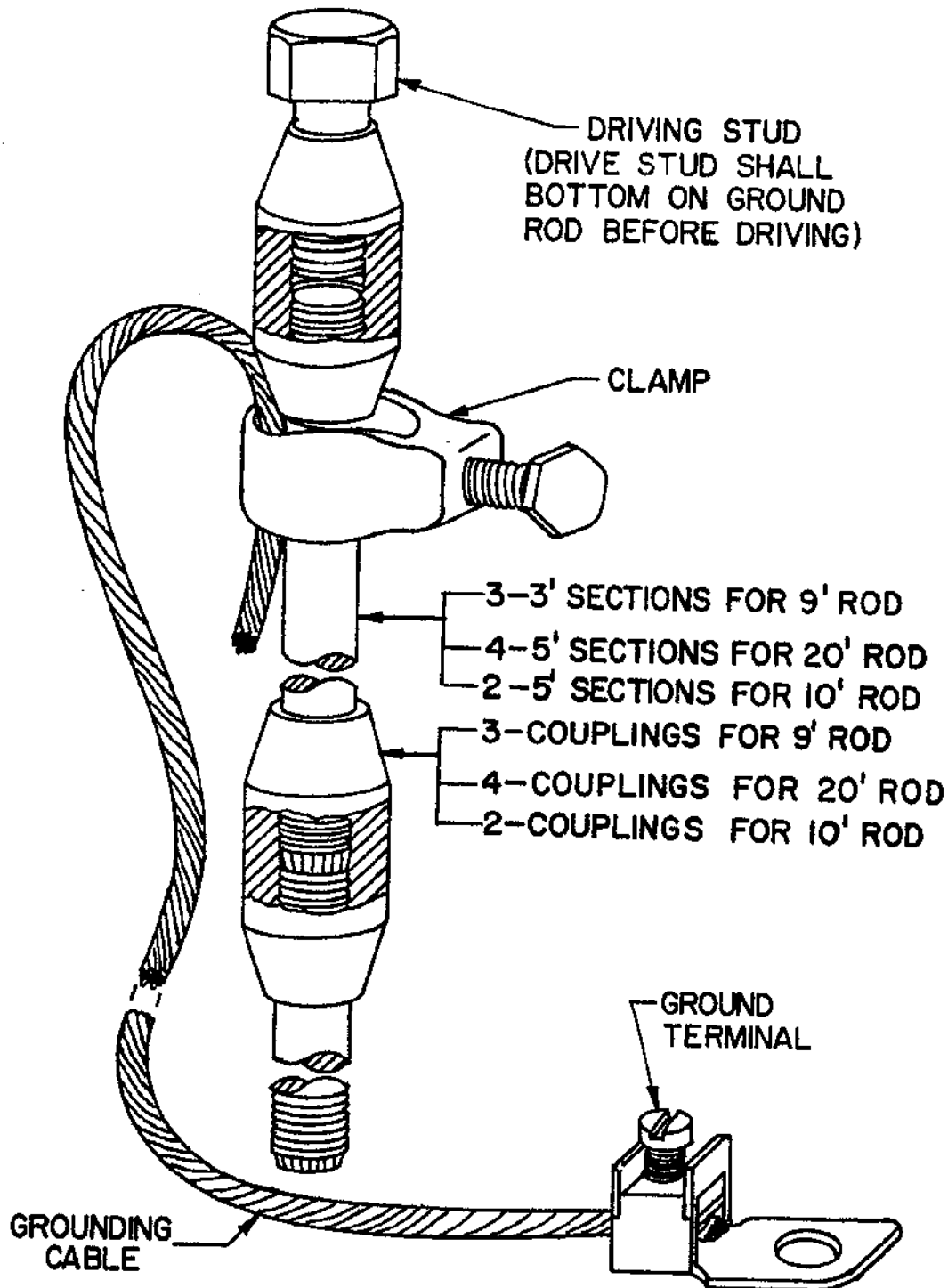
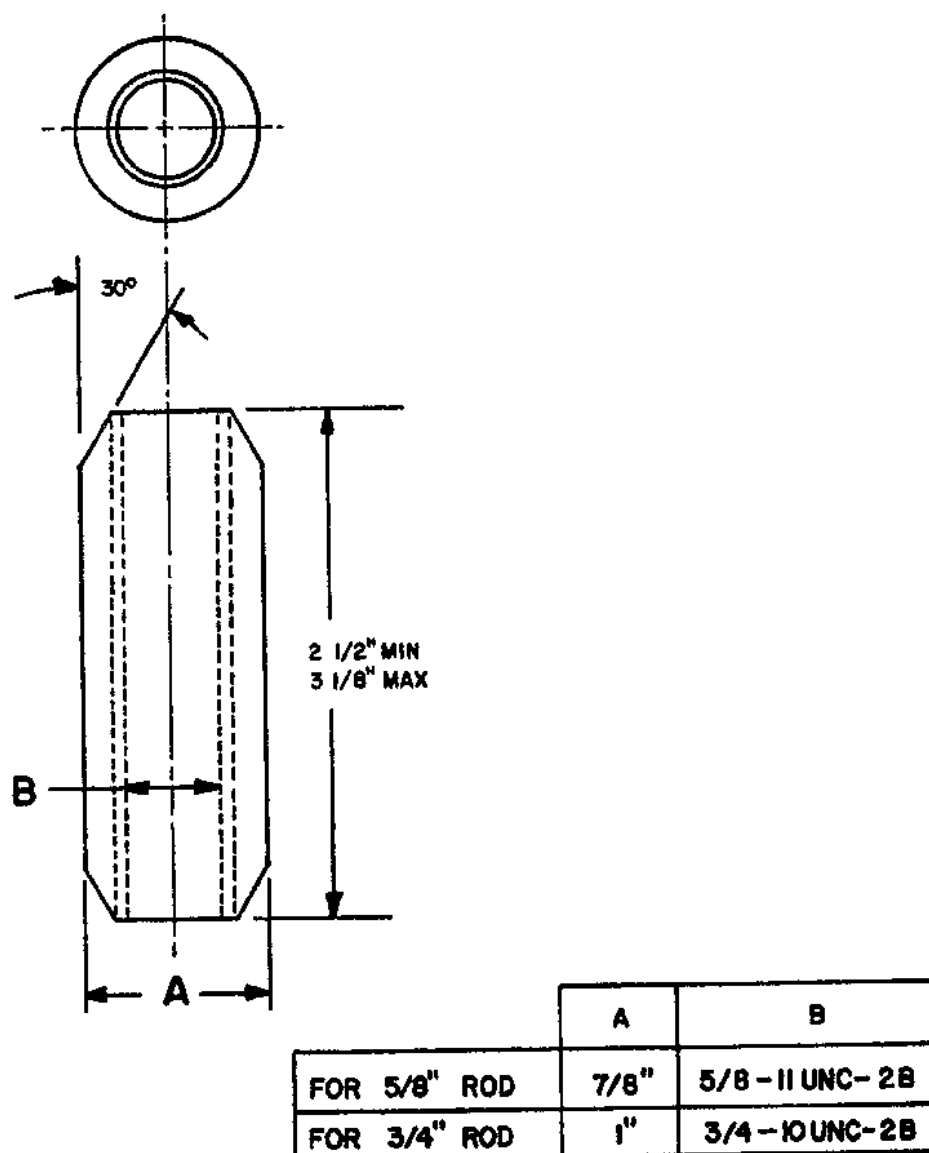


FIGURE 3. Type III, Class B, sectional rod.

X-1883B

W-R-550A  
AMENDMENT-1

W-R-550A  
AMENDMENT-1



MATERIAL: COPPER ALLOY NO. 655, HIGH SILICON  
BRONZE; 1/4 HARD TEMPER CONDITION, ROCKWELL  
B80 HARDNESS.

FIGURE 5. Coupling for Type III, Class B, sectional rod.

**X-3948 A**

W-R-550A  
AMENDMENT-1

MILITARY INTERESTS:

Custodians:

Army - ME  
Navy - YD  
Air Force - 85

Review activities

Army - EL  
Air Force - 99, 11  
DLA - GS

User activity:

Army - WC

CIVIL AGENCY COORDINATING ACTIVITY:

GSA - FSS

Preparing activity:

Army - ME

Project 5875-0534

W-R-550A  
NOTICE-1  
October 7, 1975

FEDERAL SPECIFICATION

RODS, GROUND (WITH ATTACHMENTS)

This notice was approved by the Commissioner, Federal  
Supply Service, General Services Administration.

On page 11, under "Preparing Activity" delete "Army - GL" and substitute  
"Army - ME".

FSC 5975