METRIC
MIL-S-24749(SH)
13 August 1990

MILITARY SPECIFICATION

STRAPS, ELECTRICAL GROUNDING (METRIC) GENERAL SPECIFICATION FOR

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. This specification covers the general requirements for and tests for metric electrical grounding straps, hereafter identified as bond straps.

1.2 Classification. The bond straps shall be of the following types as specified (see 6.2).

Type I - Corrosion-resisting bond straps of copper/nickel alloy with mounting bosses attached to each end
Type II - Flat CRES 316 bond strap with mounting holes in each end.
Type III - Flat copper bond strap with mounting holes in each end.
Type IV - Flat copper braid bond strap with mounting holes in each end.

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 are 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).

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 55Z3, 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 5975

SPECIFICATIONS

FEDERAL

QQ-B-575	- Braid, Wire, (Copper, Tin-Coated, or Silver Coated, Tubular, or Flat).
QQ-C-576	- Copper Flat Products with Slit, Slit and Edge-Rolled, Sheared, Sawed, or Machined Edges, (Plate, Bar, Sheet, and Strip).
QQ-N-281	- Nickel-Copper Alloy Bar, Rod, Plate, Sheet, Strip, Wire, Forgings, and Structural and Special Shaped Sections.
QQ-P-35	- Passivation Treatments for Corrosion-Resistant Steel.
PPP-B-636	- Box, Shipping, Fiberboard.

MILITARY

MIL-P-116	- Preservation, Methods of
MIL-S-1222	- Studs, Bolts, Hex Cap Screws, Socket Head Cap Screws and Nuts.
MIL-N-7786	- Nickel-Chromium Alloy, Sheet and Strip, Age Hardenable Annealed.
MIL-C-15726	- Copper-Nickel Alloy, Sheet, Plate, Strip, Bar, Rod and Wire.
MIL-S-22698	- Steel Plate, Shapes and Bars, Weldable Ordinary Strength and Higher Strength: Structural.
MIL-J-24445	- Joint, Bimetallic Bonded, Aluminum to Steel.
MS35338	- Washer, Lock-Spring, Helical, Regular (Medium) Series.
MIL-A-45225	- Aluminum Alloy Armor, Forged.

STANDARDS

MILITARY

MIL-STD-129	- Marking for Shipment and Storage.
MIL-STD-167-1	- Mechanical Vibrations of Shipboard Equipment (Type I - Environmental and Type II - Internally Excited).
MIL-STD-248	- Welding and Brazing Procedure and Performance Qualification.
MIL-STD-454	- Standard General Requirements for Electronic Equipment.
MIL-STD-1252	- Inertia Friction Welding Process, Procedure and Performance Qualification.
MIL-STD-2073-1	- DOD Material, Procedures for Development and Application of Packaging Requirements.

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

2.2 Non-Government publications. The following document(s) 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 SOCIETY FOR TESTING AND MATERIALS (ASTM)

A 666 - Standard Specification for Austenitic Stainless Steel, Sheet, Strip, Plate, and Flat Bar.
B 122 - Standard Specification for Copper-Nickel-Tin Alloy, Copper-Nickel-Zinc Alloy (Nickel Silver), and Copper-Nickel Alloy Plate, Sheet, Strip and Rolled Bar.
B 250 - Standard Specification for General Requirements for Wrought Copper-Alloy Wire. (Metric)
B 265 - Standard Specification for Titanium and Titanium Alloy Strip, Sheet, and Plate.
D 3951 - Standard Practice for Commercial Packaging. (DoD adopted)

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

(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, 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 First article. When specified (see 6.2), a sample shall be subjected to first article inspection (see 6.4) in accordance with 4.4.

3.2 Recovered materials. Unless otherwise specified herein, all equipment, material, and articles incorporated in the products covered by this specification shall be new and may be fabricated using materials produced from recovered materials to the maximum extent practicable without jeopardizing the intended use. The term "recovered materials" means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials. None of the above shall be interpreted to mean that the use of used or rebuilt products is allowed under this specification unless otherwise specifically specified.

3.2.1 Type I bond strap assembly. Type I bond strap assembly shall consist of three components; (a) one bond strap, (b) two (aluminum or steel) bimetallic bosses, and (c) two bolt/lock washer units, depending on the application (see figure 1).

3.2.1.1 Bond strap. A bond strap consists of five components; (a) one strap braid, (b) two lugs, (c) two captured bolts, (d) two disk springs, and (e) two retaining rings (see figure 2)

3.2.1.1.1 Strap braid. Strap braid shall be nickel-copper, 401 or UNS04401, in accordance with QQ-N-281 or copper-nickel, 70-30, in accordance with ASTM B 122. The wire shall conform to ASTM B 250, modified for the material specified herein. Braiding shall conform to QQ-B-575, modified for the material and construction specified herein (see figure 3).

3.2.1.1.2 Lug. Lugs shall be copper-nickel, alloy 715 (70-30), in accordance with MIL-C-15726 (see figure 3)

3 2 1.1.3 Captured bolt. Captured bolts shall be nickel-copper, alloy 500, in accordance with MIL-S-1222, annealed and aged (see figure 3)

3.2.1.1.4 Disk spring. Disk springs shall be nickel-chromium, alloy X-750, in accordance with MIL-N-7786 or nickel-copper, alloy 500, in accordance with QQ-N-281, annealed and aged (see figure 3).

3.2.1.1.5 Retaining ring. Retainer rings shall be nickel-copper, alloy 400, in accordance with QQ-N-281 (see figure 3).

3.2.1.2 Boss. Bosses shall be from bonded material, as specified herein, manufactured in accordance with either MIL-J-24445 or MIL-STD-1252 (see 4.5.2.1). Unless otherwise specified, the simulated weld heat treatment shall be 15 minutes at 1000 degrees Fahrenheit (°F) (see figure 4).

3.2.1.2.1 Aluminum bimetallic boss. Aluminum bosses shall be manufactured from aluminum, alloy 5083, in accordance with MIL-A-45225 bonded to copper-nickel, alloy 715 (70-30), in accordance with MIL-C-15726 with an interlayer of titanium, commercially pure, in accordance with ASTM B 265 (see figure 4).

3.2.1.2.2 Steel bimetallic boss. Steel bosses shall be manufactured from steel, grade D or E, in accordance with MIL-S-22698 bonded to copper-nickel, alloy 715 (70-30), in accordance with MIL-C-15726 (see figure 4).

3.2.1.3 Bolt/lock washer unit. Bolt/lock washer unit shall consist of bolt and lock-spring washer.

3.2.1.3.1 Bolt. Bolts shall be corrosion resistant steel (CRES) 321, in accordance with MIL-S-1222 (see figure 5).

3.2.1 3.2 Washer, lock-spring, helical. Washers shall be corrosion resistant steel (CRES) 321, in accordance with MS35338 (see figure 5).

3.2.2 Type III bond strap. Bond strap material shall be flat copper in accordance with QQ-C-576 (see figure 6).

3.2.3 Type II bond strap. Bond strap material shall be flat corrosion resistant steel (CRES) 316 in accordance with ASTM A 666, annealed and passivated in accordance with QQ-P-35 (see figure 6).

3.2.4 Type IV bond strap. Type IV bond strap shall consist of two components; (a) one strap braid, and (b) two end terminals (see figure 7)

3.2.4.1 Braid. Bond strap braid material shall be flat copper braid in accordance with QQ-B-575.

3.2.4.2 End terminal. End terminals shall be flat copper in accordance with QQ-C-576.

3.3 Physical requirements. Bond strap dimensions shall be as specified herein. Dimensions are in millimeters (mm), unless otherwise noted. Strap length shall be of standard sizes as detailed on figures 2, 6, and 7 or as specified by the contracting activity (see 6 2).

3.3.1 Type I bond strap assembly.

3.3.1.1 Strap braid. Strap braid shall meet the dimensions as detailed on figure 3.

3.3.1.2 Lug. Lugs shall meet the dimensions as detailed on figure 3.

3.3.1.3 Captured bolt. Captured bolt shall meet the dimensions as detailed on figure 3.

3.3.1 4 Disk spring. Disk springs shall meet the dimensions as detailed on figure 3. Mechanical properties shall be controlled to provide a minimum of 90.72 kilogram (kg) load when fully compressed.

3.3.1.5 Retaining ring. Retainer rings shall meet the dimensions as detailed on figure 3.

3.3.1.6 Bosses. Bosses shall meet the dimensions as detailed on figure 4.

3.3.1.7 Bolt. Bolts shall meet the dimensions as detailed on figure 5.

3.3.1.8 Washer, lock-spring, helical. Washers shall meet the dimensions as detailed in MS35338, for the 7 93 mm nominal size.

3.3.2 Type II, III, and IV bond straps. Bond straps shall be furnished in the dimensions detailed on figures 6 and 7. Bond strap dimensions shall be applicable after manufacturing. Type II and III bond strap length to width shall not exceed a 5 to 1 ratio.

3.3.3 Fabrication. Bond strap assembly shall conform to the fabrication details on figures 2, 3, 4, and 5, and as specified herein. Fabrication techniques shall be used which lend themselves to automation, allowing ease of manufacturing at minimum cost. The braid to lug weld, for the type I bond strap, shall be any weld procedure that will meet the requirements as specified herein.

3.4 Performance requirements.

3.4.1 Visual inspection. When tested as specified in 4.6.1, bond straps shall be visually inspected to insure conformance with the requirements as specified herein (see 3.2, 3.3 and 3.5).

3.4.2 Type I bond strap boss. Bosses shall be tested as specified in 4.6.2 and meet the requirements contained therein.

3.4.3 Pull test. When tested as specified in 4 6.3, type I bond straps shall withstand 453.6 kg No visually observable wire breakage shall occur.

3.4.4 Vibration. Type I and IV bond straps shall be tested as specified in 4 6 4 Any current interruption of one microsecond or longer shall be reason for rejection of the sample.

3.4.5 Conformability and flexibility. Type I and IV bond straps shall be tested as specified in 4.6.5. The strap shall exhibit no visual evidence of wire breakage.

3.4.6 Weld qualification. Type I bond straps shall be tested as specified in 4.6 6 and meet the requirements specified therein

3.4.7 Electrical resistance. Type I and type IV bond straps shall be tested as specified in 4.6.7. The strap direct current (dc) resistance shall not exceed 1 milliohm per 2.54 centimeters (cm) of strap length.

3.5 Identification. Bond straps shall be marked with an identifying legend consisting of the part number (see 6.2 and 6.5), and the manufacturer's Commercial and Government Entity (CAGE) code. Type I bond strap bosses shall be marked with the metal type of the boss foot, "AL" for aluminum, and "ST" for steel Marking shall be by metal stamp with a minimum character height of 2.03 mm.

3.6 Workmanship. Every detail of manufacture shall be in accordance with the best practices for manufacture of bond straps, the workmanship requirements of MIL-STD-454, and the following:

(a) The materials used shall be free from all defects that could adversely affect installation, appearance, or long term use
(b) Lug terminals, flat copper straps, and soldered terminals of flat braid straps shall be free from blistering, burrs, cracks, laps, peeling, pitting, sharp edges, slag, or other foreign material which could affect welding or bond strap installation. The braid entry edge of the lug and terminals shall be radiused to minimize braid shear.

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

(a) First article inspection (see 4.4).
(b) Quality conformance inspection (see 4.5).

4.3 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in 4.5.

4.4 First article inspection. A first article preliminary inspection shall determine that all samples are acceptable products for testing and that obvious defects are detected prior to the tests Sample bond straps having any defect that may affect the results of first article testing shall be rejected.

4.4.1 First article testing. A first article sample of each type bond strap, as specified by the contracting activity, shall be tested and shall be representative of the bond straps to be provided under the contract. The testing shall be conducted as specified in the contract.

4.4.2 Sequence of inspection. Samples shall be tested as specified in table I

TABLE I. First article inspection and testing.

Inspection/test	Requirement	Test	Defects
Type I bond strap			
Visual inspection	3.3, 3.4.1, 3.5, and 3.6	4.6.1	Minor
Type I bond strap bosses	3.4.2	4.6.2.1	Major
Pull test	3.4.3	4.6.3	Major
Vibration	3.4.4	4.6.4	Major
Conformability and flexibility	3.4.5	4.6.5	Major
Weld qualification	3.4.6	4.6.6	Major
Electrical resistance	3.4.7	4.6.7	Major
Packaging	Sect 5	4.6.8	Minor
Type II bond strap			
Visual inspection	3.3, 3.4 1, 3.5, and 3.6	4.6.1	Minor
Packaging	Sect 5	4.6.8	Minor
Type III bond strap			
Visual inspection	3.3, 3.4.1, 3.5, and 3.6	4.6.1	Minor
Packaging	Sect 5	4.6.8	Minor
Type IV bond strap			
Visual inspection	3.3, 3.4.1, 3.5, and 3.6	4.6.1	Minor
Vibration	3.4.4	4.6.4	Major
Conformability and flexibility	3.4.5	4.6.5	Major
Electrical resistance	3.4.7	4.6.7	Major
Packaging	Sect 5	4.6.8	Minor

4.4.3 Number of units to be inspected. A first article sample of each type bond strap delivered under this specification shall be tested as specified by the contracting activity (see 6.3). Any changes to the materials or product design delivered under this specification that deviate from the samples tested shall automatically require retesting and recertification of the product samples

4.5 Quality conformance inspection. Quality conformance inspections shall be as specified in table II.

4.5.1 Inspection lot. An inspection lot is defined as items of the same type, size, material, and style produced at the same facility using the same purchased components, production processes and equipment.

4.5.2 Quality conformance inspection sampling. As a minimum, the contractor shall inspect a sample quantity of conduits and fittings in accordance with the sampling plan defined herein. Sample size depends of classification on the characteristic as shown in Table III. The sample size for each characteristic is shown in Table II. If one or more defects is found in any sample, the entire lot shall be rejected and screened 100% by the contractor for defect found.

Table II. Quality conformance inspection sampling.

Lot Size	Critical Characteristic	Major Characteristic	Minor Characteristic
2 to 8	All	All	3
9 to 15	All	All	3
16 to 50	All	20	3
26 to 50	All	20	5
51 to 90	All	20	6
91 to 150	125	20	7
151 to 280	125	20	10
281 to 500	125	47	11
501 to 1200	125	47	15
1201 to 3200	125	53	18
3201 to 10,000	192	68	22
10,001 to 35,000	294	77	29
35,001 to 150,000	294	96	29

4.5.2.1 Test criteria. Quality conformance testing shall be in accordance with MIL-J-24445. When quality conformance testing bosses manufactured in accordance with MIL-STD-1252, a representative lot sample of bended bosses shall be selected and substituted for sample plate sections as specified in MIL-J-24445 for lot sampling.

TABLE II. Quality conformance inspection and testing.

Inspection test	Requirement	Test	Defects
Type I bond strap assembly			
Visual inspection	3.4.1 and 3.6	4.6.1	Minor
Type I bond strap bosses	3.4.2	4.6.2.2	Major
Pull test	3.4.3	4.6.3	Major
Electrical resistance	3.4.7	4.6.7	Major
Packaging	Sect 5	4.6.8	Minor
Type II and III bond strap			
Visual inspection	3.4.1 and 3.6	4.6.1	Minor
Packaging	Sect 5	4 6.8	Minor
Type IV bond strap			
Visual inspection	3.4.1 and 3.6	4.6.1	Minor
Electrical resistance	3.4.7	4.6.7	Major
Packaging	Sect 5	4.6.8	Minor

4.6 Methods of test.

4.6.1 Visual inspection. A visual inspection shall be performed on all samples prior to testing. The inspection shall determine that all samples are acceptable products for testing and that obvious defects are identified priorto the start of tests. The visual inspection shall determine conformance to, but shall not be limited to, the requirements of 3.2, 3.3, 3.4, 3.5, and 3 6. Sample products having defects that may affect the results of testing shall be rejected.

4.6.2 Type I bond strap bosses.

4.6.2.1 First article testing, bosses. Both aluminum/copper-nickel and steel/copper-nickel material, from which bosses are to be produced, are to be subjected to the first article test requirements of MIL-J-24445 and as specified in 4.6.2.2. All specified first article tests, including fatigue tests, shall be performed.

4.6.2.2 Quality conformance testing, bosses. The products from which the bosses are produced shall be quality conformance tested in accordance with the requirements of MIL-J-24445 Unless specifically addressed otherwise in that specification, the requirements specified for aluminum to steel shall apply for both the aluminum to copper-nickel boss material and the steel to copper-nickel boss material, except that the simulated weld heat treatment shall be 15 minutes at 1000°F

4.6.3 Pull test. Type I bond straps shall be placed in a tensile testing configuration with the load distribution shown on figure 8 used as guidance. The load shall be 453.6 kg and maintained within plus or minus 22.68 kg for 3 minutes. The strap shall meet the requirements as specified in 3.4.3.

4.6.4 Vibration. Type I and IV bond straps shall be attached to a vibration table, using figure 9 as guidance, and tested in accordance with the endurance test of MIL-STD-167-1. The test frequency range shall be from 4 to 33 hertz heat a table amplitude of 0.0508 + 0.01016 cm as specified therein. The test sample shall be isolated from ground, wired in series, and a current of 100 + 10 milliamperes shall be made to flow through the series circuit during the test. A suitable instrument shall be used to monitor the current flow and to indicate any discontinuity of contact or interruption of current flow of one microsecond or longer. Strap assemblies shall meet the requirements as specified in 3.4.4.

4.6.5 Conformability and flexibility. Conformability and flexibility of sample straps shall be confirmed by bending the strap 180 degrees back and forth over a 2.54 cm diameter pin for fifty cycles the bending force shall not exceed 2.268 kg. The strap shall meet the requirements of 3.4.5.

4.6.6 Weld qualification Type I bond straps shall be tested in accordance with MIL-STD-248 for the braid-lug welds (see figure 1) and meet the requirements specified therein.

4.6.7 Electrical resistance. Type I and IV bond straps shall be tested for dc resistance between the aluminum foot of the aluminum to copper-nickel boss and the steel foot of the steel to copper-nickel boss for the type I bond strap assembly (see figure 9) or from lug end to lug end for the type IV bond strap. The strap assembly shall not exceed the requirements as specified in 3.4.7

4.6.8 Packaging inspection. The preservation, packing, and marking shall be inspected to verify conformance to the requirements of section 5

5. PACKAGING

(The packaging requirements specified herein apply only for direct Government acquisition. For the extent of applicability of the packaging requirements of referenced documents listed in section 2, see 6.7.)

5.1 Preservation. Preservation shall be level A or commercial, as specified (see 6.2).

5.1.1 Level A. Bonding straps of the same type and length, or bosses of the same foot material, in the quantity specified (see 6.2), shall be unit protected in accordance with MIL-P-116, method III for straps of similar metals and methods IC for straps containing dissimilar metals with the selection of the sub-method to method IC at the option of the contractor.

5.1.2 Commercial. Bonding straps of the same type and length, or bosses of the same foot material, in the quantity specified (see 6.2), shall be unit protected in accordance with ASTM D 3951.

5.2 Packing. Packing shall be level A, B, C, or commercial, as specified (see 6.2).

5.2.1 Levels A, B, and C. Packing, exterior containers for levels A, B, and C shall conform to the exterior container selection tables listed in MIL-STD-2073-1, with container selection at the option of the contractor. Containers shall be limited to a gross weight of 90.72 kg except that fiberboard containers shall be limited to the gross weight specified for the container to be used. Container closure and reinforcement shall be in accordance with the applicable container specification or appendix thereto, except that PPP-B-636 fiberboard boxes shall be closed by method V for weather resistance and method I for domestic grade boxes as specified in the appendix to the box specification.

5.2.2 Commercial. Commercial packing shall conform to ASTM D 3951.

5.3 Marking. In addition to any special marking required (see 6.2), interior packing and exterior containers for levels A, B and C shall be marked in accordance with MIL-STD-129. Commercial interior packs and exterior containers shall be in accordance with ASTM D 3951. Bar code markings shall be included.

5 3.1 Strap information. Information shall be furnished with the bond straps and shall include manufacturer's lot number, part number, length, and marking information.

6. NOTES

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

6.1 Intended use. The bond straps covered by this specification are intended, but not limited to, shipboard bonding applications and as specified for secure electrical information processing (SEIPS) equipment bonding. Recommended usage should be as follows:

(a) Type I and II - For bonding items in areas of environmental stresses (such as, installations exposed to the weather), where corrosion is a major concern.

(b) Type III and IV - For bonding items in non-weather exposed areas.

6.2 Acquisition requirements. Acquisition documents must specify the following:

(a) Title, number, and date of this specification.
(b) Type of bond strap (see 1.2)
(c) Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).
(d) When first article inspection is required (see 3.1).
(e) Whether bolts, disk springs and retainer rings are to be procured individually (see figure 2).
(f) Whether other than standard bond strap lengths are required (see 3.3).
(g) Level or commercial packaging required (see 5.1 and 5.2).
(h) Special marking required (see 5.3).

(i) Bond strap part number(s), when applicable (see 3.5 and 6.5.1).
(j) Quantity of bond straps.
(k) Boss part number(s), for type I strap assemblies, when applicable (see 6.5.2).
(l) Quantity of each boss foot material type.
(m) Quantity of each individual component(s).
(n) Any special instructions or remarks.

6.3 Consideration of data requirements. The following data requirements should be considered when this specification is applied on a contract. The applicable Data Item Description (DIDs) should be reviewed in conjunction with the specific acquisition to ensure that only essential data are requested/provided and that the DID's are tailored to reflect the requirement of the specific acquisition. To ensure correct contractual application of the data requirements, a Contract Data Requirements List (DD Form 1423) must be prepared to obtain the data, except where DOD FAR supplement 27.475-1 exempts the requirement for a DD Form 1423

Reference Paragraph	DID Number	DID Title	Suggested Tailoring
4.4.3	DI-E-2121	Certificate of Compliance	----

The above DID's were those cleared as of the date of this specification. The current issue of DOD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL), must be researched to ensure that only current, cleared DID's are cited on the DD Form 1423.

6.4 First article. When first article inspection is required, the contracting officer should provide specific guidance to offerors whether the item(s) should be a first article sample, a first production item, or a standard production item from the contractor's current inventory and the number of items to be tested as specified in 4.4 The contracting officer should also include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results, and disposition of first articles. Invitations for bids should provide that the Government reserves the right to waive the requirements for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract. Bidders should not submit alternate bids unless specifically requested to do so in the solicitation.

6.5 Part or identifying numbers (PINS).

6.5.1 Bond straps. Bond straps shall be identified by a combination of digits and letters in accordance with the following:

EXAMPLE: M24749-I-B-L-W-H

M24749	-I	-B	-L	-W	-H

Specification Number	Standard size code (Omitted if size is nonstandard, see 3.3)	Width (Optional only for types II and III bond straps, in nonstandard sizes, see 3.3)

Bond strap type (see 1.2)	Length (Optional only for nonstandard sizes, see 3.3)	Hole Dia (Optional only for types II and III bond straps in nonstandard sizes see 3.3)
I - Type I		
II - Type II		
III - Type III		
IV - Type IV		

6.5.2 Type I bond strap bosses. Bosses shall be identified by a combination of digits and letters in accordance with the following:

EXAMPLE: M24749-A

M24749	-A
Specification number	Boss foot material (see 3.2.1.1)
	A - Aluminum to copper-nickel
	S - Steel to copper-nickel

6.5.3 Bolt/lock washer unit. Bolt/lock washer units shall be identified by a combination of digits and letters in accordance with the following:

EXAMPLE: M24749-B-L

M24749-B-L	-B	-L
Specification number	Bolt (see 3.2.1.3.1)	Lock-spring washer (see 3.2.1.3.2)

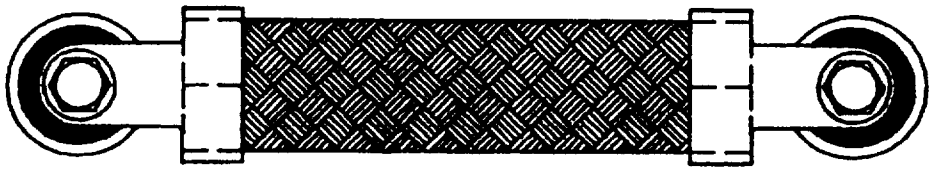
6.6 Rejected lots. Rejected inspection lots may be resubmitted for Government acceptance only if the manufacturer performs a 100 percent inspection on bond straps for those characteristics which were defective, removes all defective units, and resubmits the lot for quality conformance inspection. Resubmitted lots shall be kept separate from the new lots and shall be clearly identified as a resubmitted lot. Resubmitted lots shall be inspected using the tightened procedure of MIL-STD-105 and shall not be thereafter tendered for acceptance unless the former rejection or requirement of correction is disclosed

6.7 Sub-contracted material and parts. The packaging requirements of the reference 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.

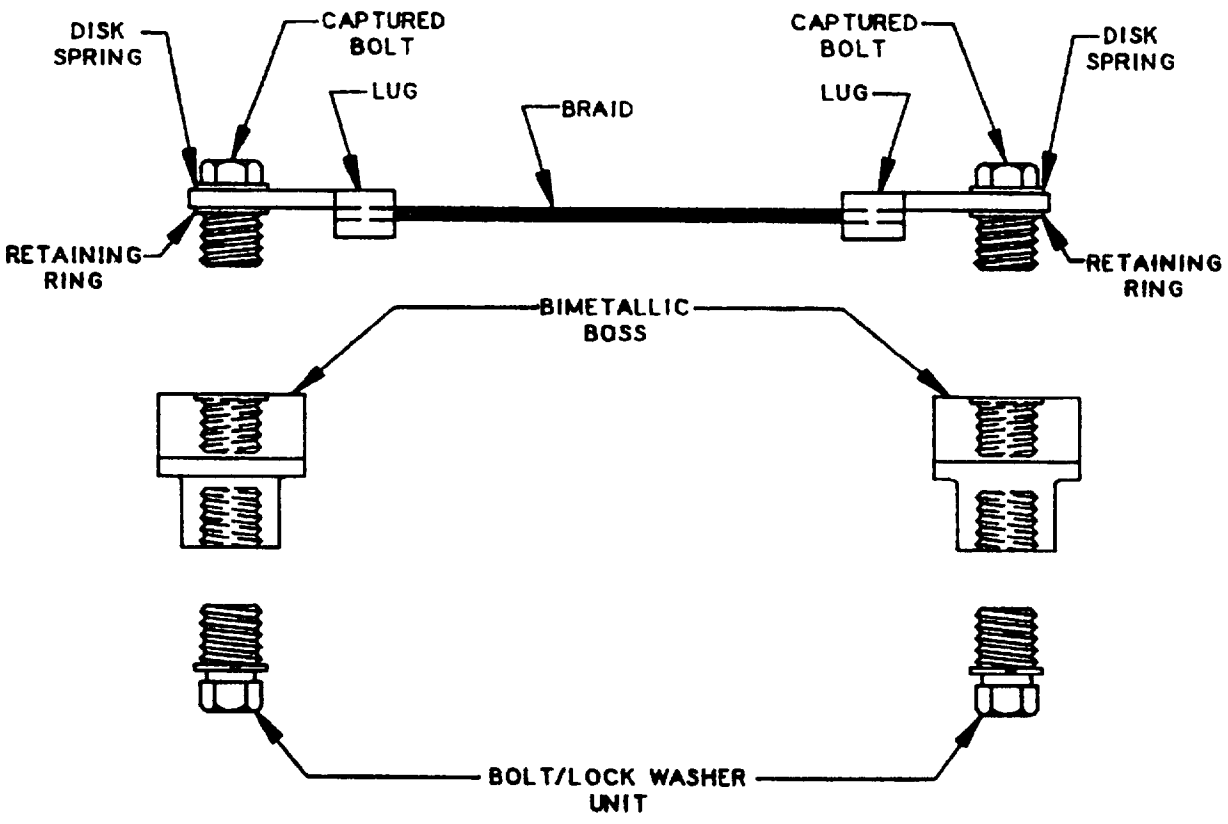
6.8 Subjected term (key word) listing.

Bonding
Bonding straps
Grounding
Lug terminals

Preparing activity:
Navy - SH
(Project 5975-N650)

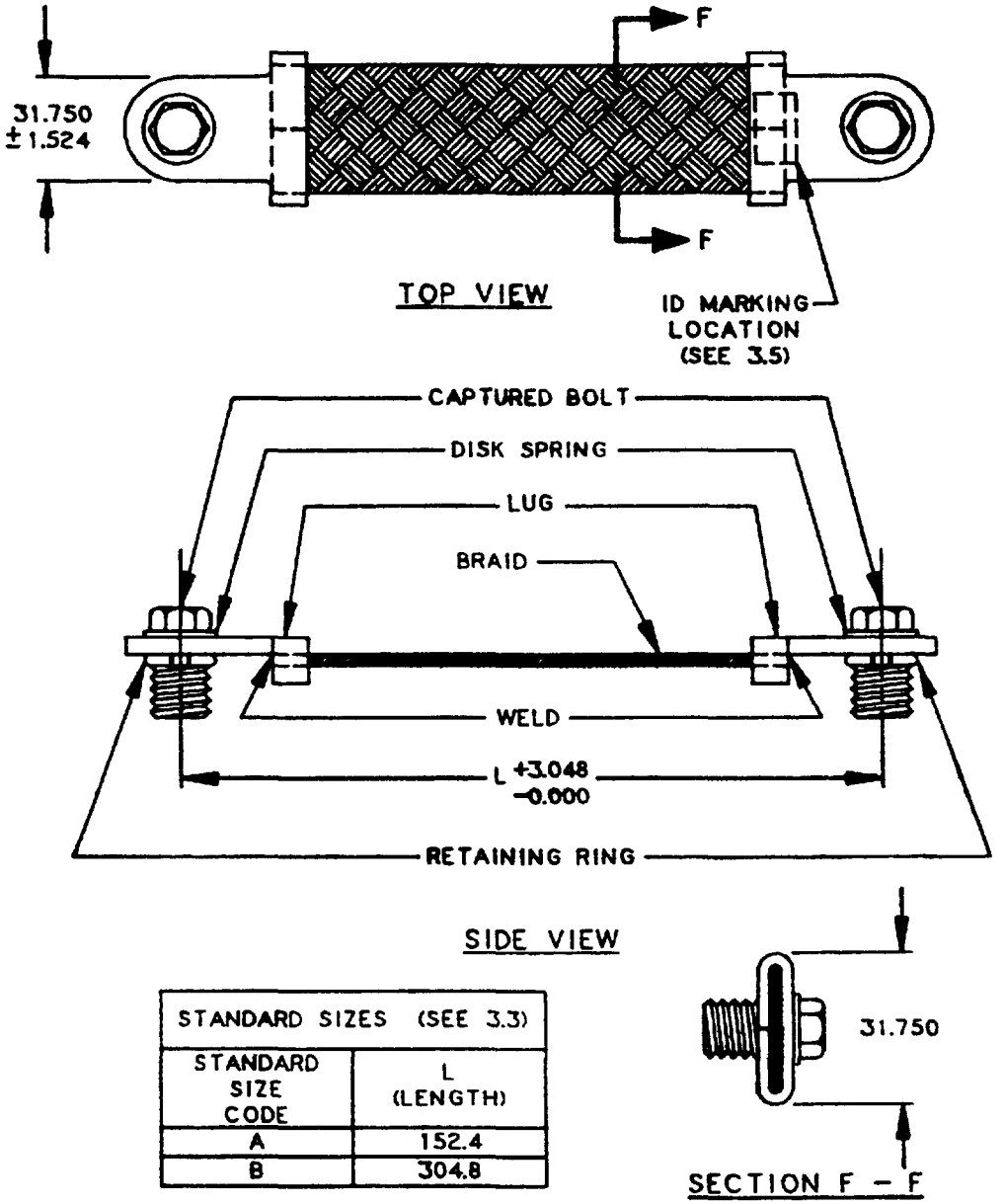


TOP VIEW



SIDE VIEW

FIGURE 1. Type I bond strap assembly.



STANDARD SIZES (SEE 3.3)	
STANDARD SIZE CODE	L (LENGTH)
A	152.4
B	304.8

NOTES

1. THE SEPARATION BETWEEN THE ENDS OF THE LUG BASE, AFTER BENDING, SHALL NOT EXCEED 0.127. WELDING OF THIS JOINT IS NOT REQUIRED.
2. THE BRAID TO LUG JOINTS ARE TO BE MADE BY WELDING. PROCEDURES ARE TO BE IN ACCORDANCE WITH, AND QUALIFIED TO, MIL-STD-248 (SEE 3.4.6). THE BRAID MAY EXTEND PAST THE LUG EDGE, BUT NOT GREATER THAN 1.588 MM, TO AIDE IN WELDING.
3. CAPTURED BOLTS, DISK SPRINGS AND RETAINER RINGS MAY BE PROCURED INDIVIDUALLY (SEE 6.2.)
4. LENGTH (L) MAY BE SPECIFIED IN NON-STANDARD SIZES (SEE 6.5 1). THE PERMITTED LENGTH TOLERANCE IS +3.048 −0.000
5. ALL SIZES ARE IN MILLIMETERS.

FIGURE 2. Type I bond strap fabrication details.

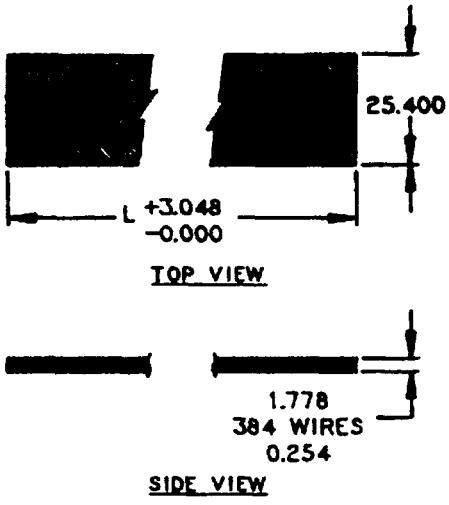


FIGURE 3a. Braid.

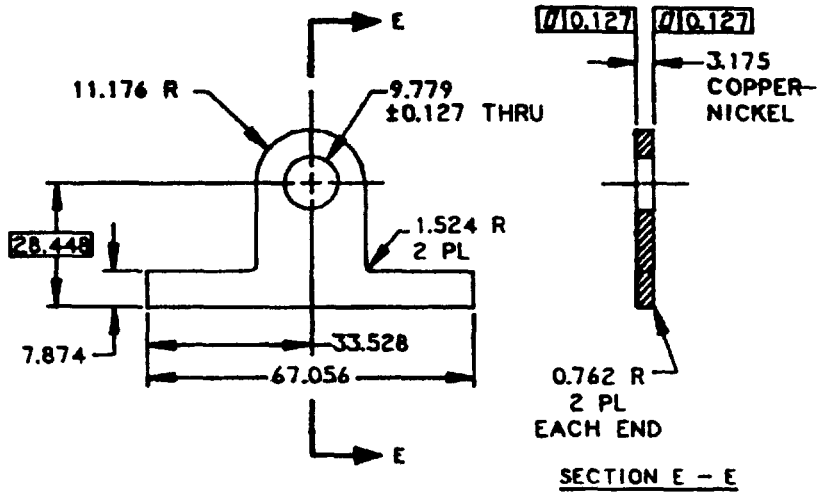


FIGURE 3b. Lug.

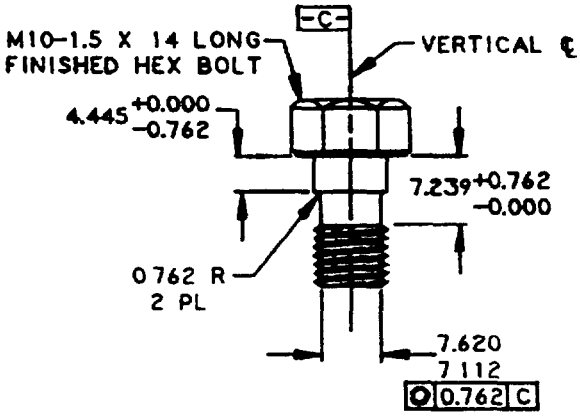


FIGURE 3c. Captured Bolt.

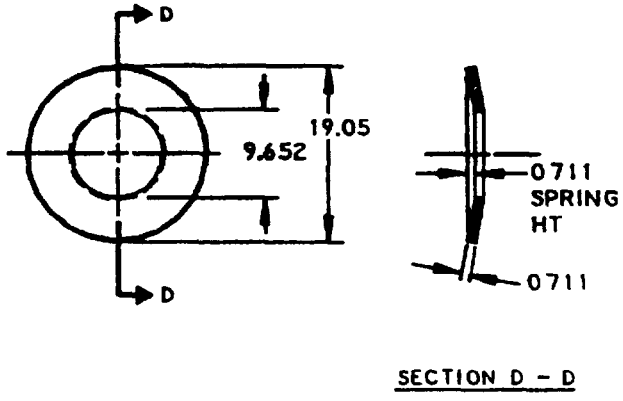


FIGURE 3d. Disk Spring.

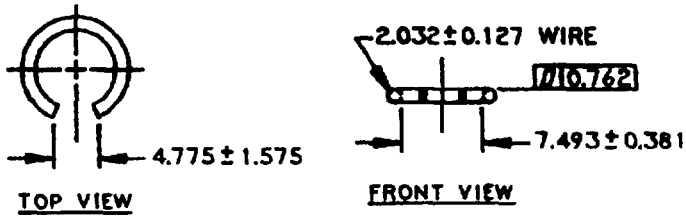


FIGURE 3e Retaining Ring

FIGURE 3. Type I bond strap components. (dimensions in mm)

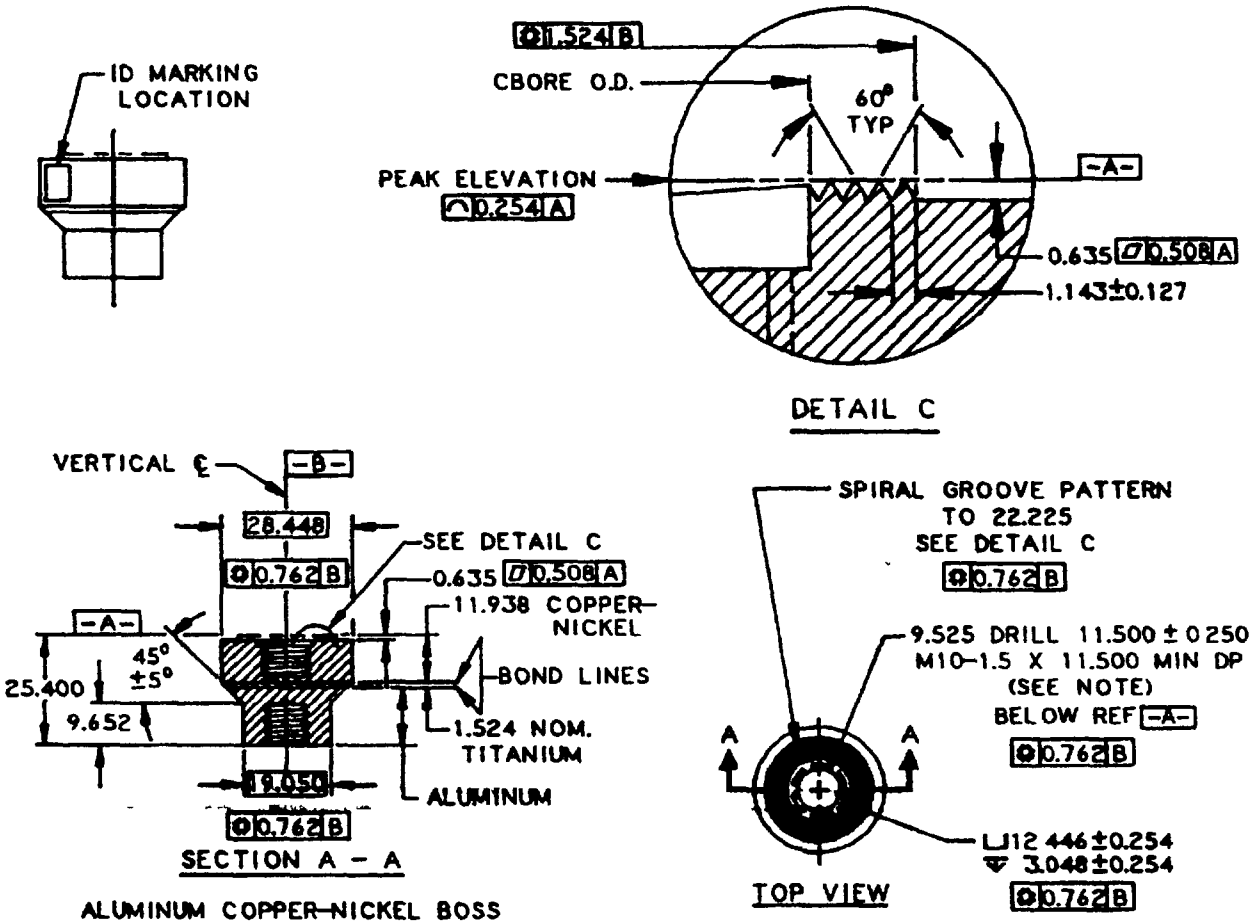


FIGURE 4a. Aluminum bimetallic boss.

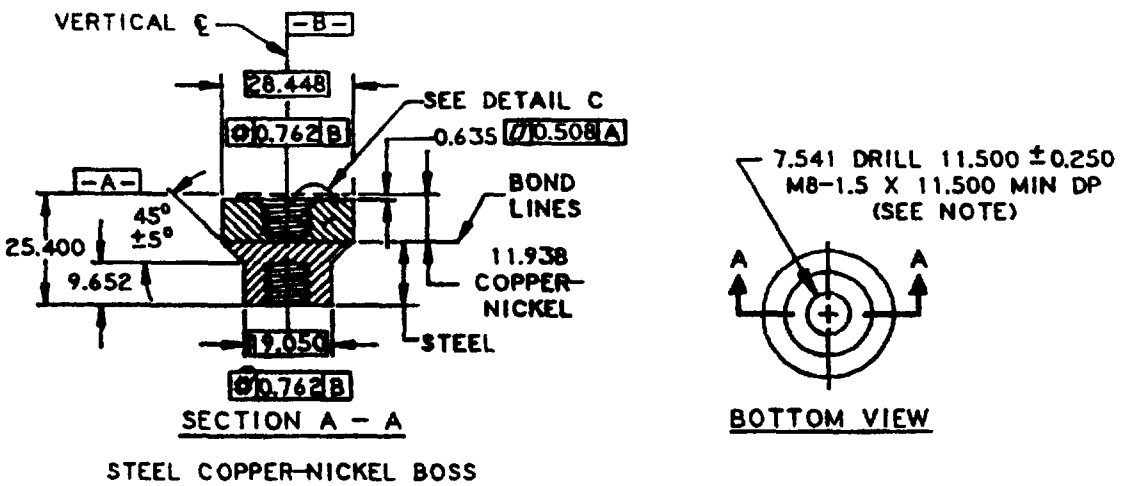


FIGURE 4b Steel bimetallic boss.

NOTES

1. BOLT HOLES SHALL NOT PENETRATE THROUGH INITIAL MATERIAL LAYER.
2. ALL SIZES ARE IN MILLIMETERS.

FIGURE 4. Bosses.

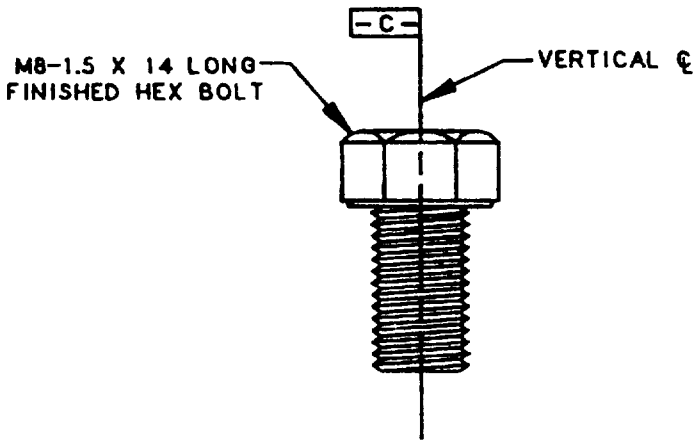


FIGURE 5a. Bolt.

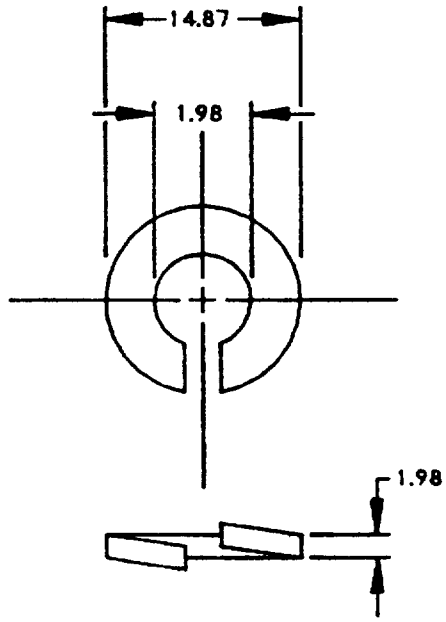
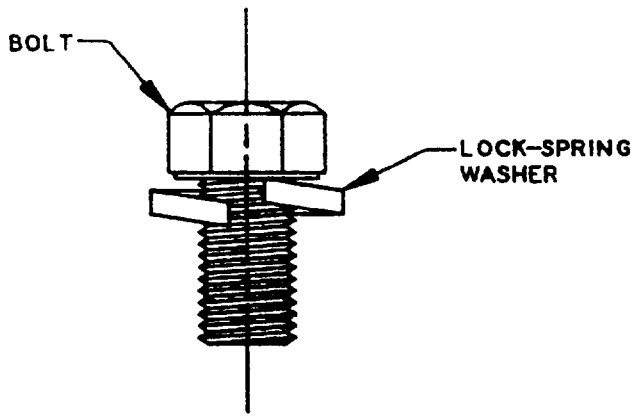
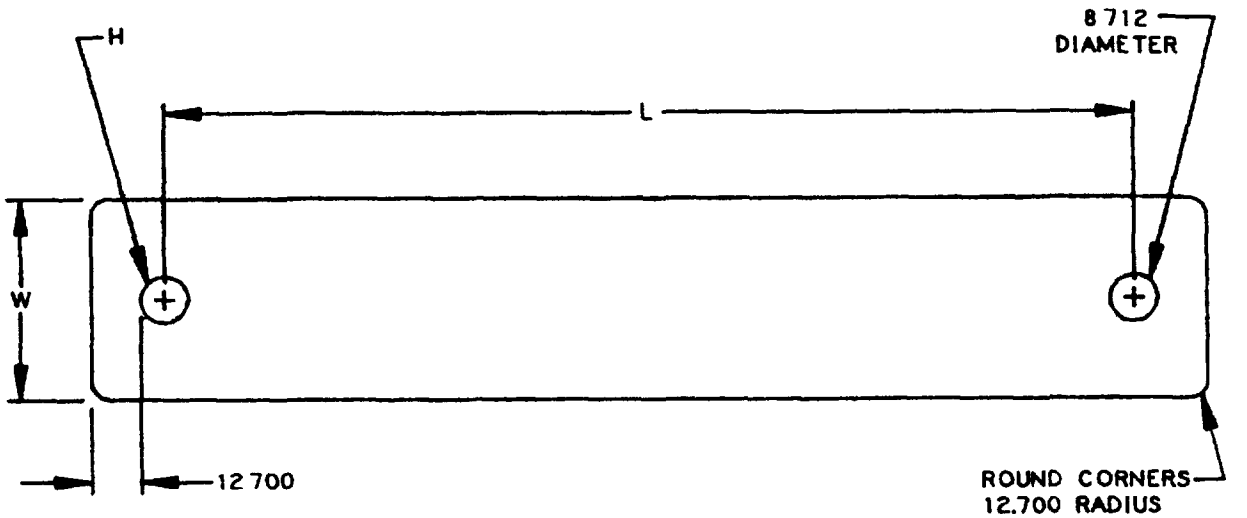


FIGURE 5b. Lock-spring washer.

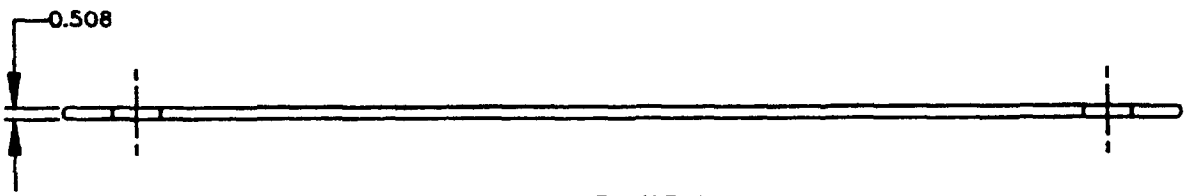


NOTE:
1 ALL SIZES ARE IN MILLIMETERS.

FIGURE 5. Bolt/lock washer unit.



TOP VIEW



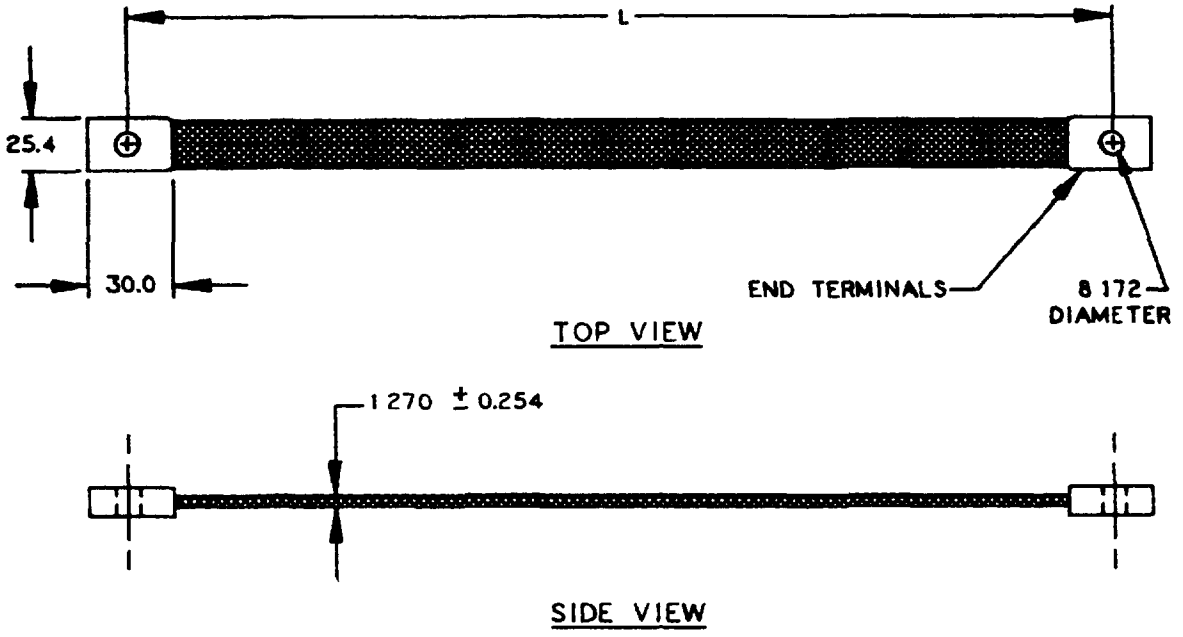
SIDE VIEW

STANDARD SIZES (SEE 3.3)			
STANDARD SIZE CODE	L (LENGTH)	W (WIDTH)	H HOLE DIA
A	76.2	25.4	8.712
B	152.4	38.1	8.712
C	228.6	50.8	8.712
D	304.8	63.5	8.712

NOTES:

1. LENGTH (L), WIDTH (W) AND HOLE DIAMETER (H) MAY BE SPECIFIED IN NON-STANDARD SIZES (SEE 6.5.1).
2. ALL SIZES ARE IN MILLIMETERS.

FIGURE 6. Type II and III bond strap fabrication details.

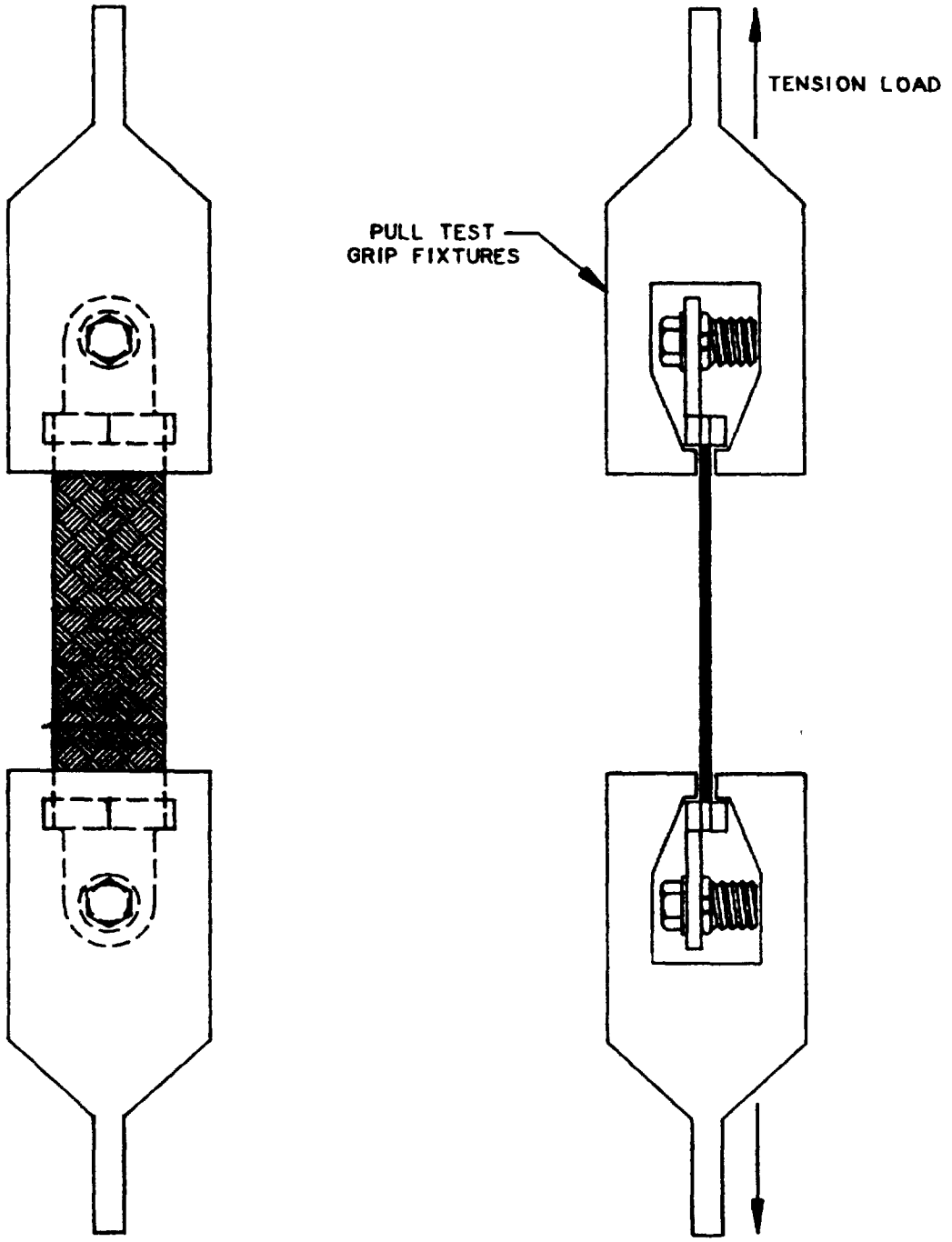


STANDARD SIZES (SEE 3.3)	
STANDARD SIZE CODE	L (LENGTH)
A	152.4
B	304.8
C	457.2

NOTES

1. END TERMINALS SHALL BE 30.0 MM LONG BY 50.8 MM WIDE BEFORE BENDING
2. END TERMINALS SHALL BE HOT TIN DIPPED WITH A COATING OF SOLDER ON ONE SIDE. EACH TERMINAL SHALL BE BENT 180 DEGREES WIDTHWISE, WITH SOLDER COATED SIDE ON THE INSIDE OF THE BEND, TO FIT THE BRAID USING A 1.588 MM METAL PLATE AS A BENDING TEMPLATE.
3. BRAID MATERIAL SHALL BE FLUX COATED 25.4 MM ON EACH END. END TERMINALS SHALL BE HEATED AND COMPRESSED ONTO THE BRAID ENSURING GOOD SOLDER FLOW.
4. HOLES SHALL BE PUNCHED IN EACH END AFTER END TERMINAL INSTALLATION.
5. LENGTH (L) MAY BE SPECIFIED IN NON-STANDARD SIZES (SEE 6.5.1)
6. ALL SIZES ARE IN MILLIMETERS

FIGURE 7. Type IV bond strap fabrication details.



NOTE

GRIPS SHALL BE DESIGNED TO TRANSFER LOAD UNIFORMLY TO THE BASE OF THE LUGS, ACROSS ENTIRE WIDTH OF LUG

FIGURE 8. Pull test.

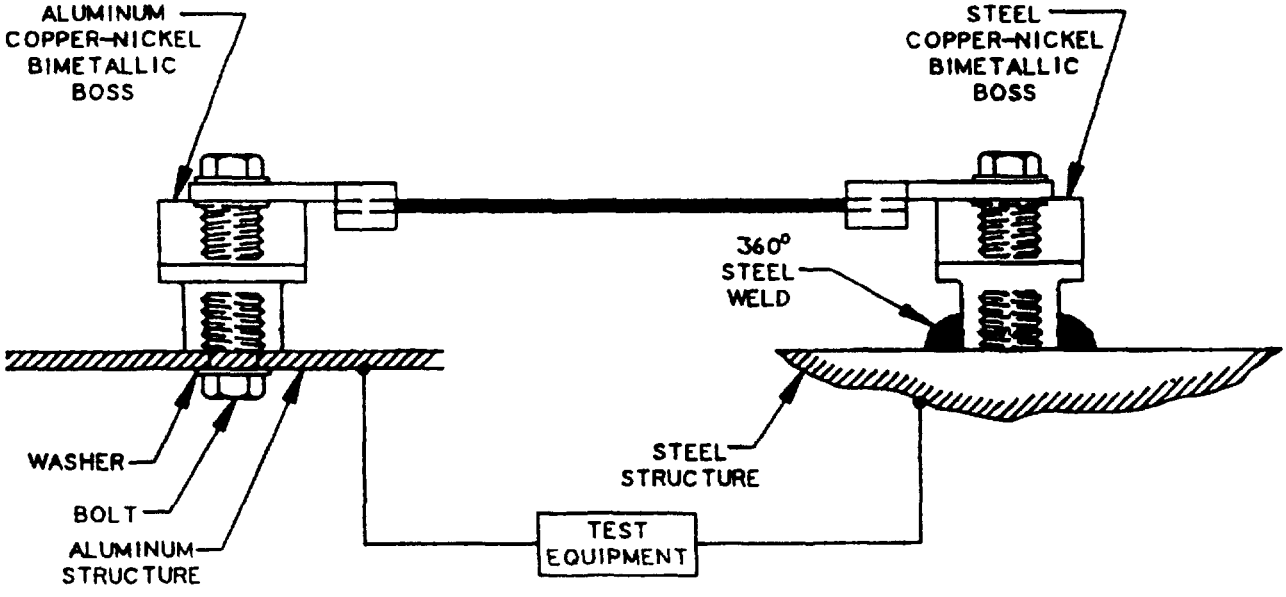


FIGURE 9. Test configuration.

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.
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I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-S-24749(SH)	2. DOCUMENT DATE (YYMMDD)

3. DOCUMENT TITLE
STRAPS, ELECTRICAL GROUNDING (METRIC) GENERAL SPECIFICATION FOR

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle Initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON (If applicable)	7. DATE SUBMITTED (YYMMDD)

8. PREPARING ACTIVITY

a. NAME Technical Point of Contact (TPOC): Mr. Berman (06D4221) PLEASE ADDRESS ALL CORRESPONDENCE AS FOLLOWS:	b. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON TPOC: 703-602-3825
c. ADDRESS (Include Zip Code) Commander, Naval Sea Systems Command Department of the Navy (SEA 55Z3) Washington, DC 20362-5101	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340