

MIL-I-15265B(SHIPS)  
 15 March 1967  
 SUPERSEDING  
 MIL-I-15265A(SHIPS)  
 11 April 1963  
 (See 6. 6)

**MILITARY SPECIFICATION**  
**INSULATION, ELECTRICAL, PLASTIC**  
**(SUBMARINE BUS BAR COVERING)**

**1. SCOPE**

1.1 Scope. - This specification covers plastic, electrical insulating materials used primarily for covering submarine bus bars and battery intercell connections. Other applications may be considered where a tough plastic covering is needed over metal surfaces.

1.2 Classification. - Plastic electrical insulation shall be of the following types, as specified (see 6. 2):

<u>Type</u>	<u>Description</u>
P	Resin - plasticizer dispersion (plastisol)
T	Heat - reactive thin wall non-rigid tubing

**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 the specification to the extent specified herein.

**STANDARDS**

**FEDERAL**

FED-STD-406 - Plastics: Methods of Testing.  
 FED-STD-601 - Rubber: Sampling and Testing.

**MILITARY**

MIL-STD-104 - Limits for Electrical Insulation Color.  
 MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.

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

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

**AMERICAN SOCIETY FOR TESTING AND MATERIALS STANDARDS**

D-149 - Dielectric Breakdown Voltage and Dielectric Strength of Electrical Insulating Materials at Commercial Power Frequencies.  
 D-257 - Test for Electrical Resistance of Insulating Materials.  
 D-876 - Testing Non-rigid Vinyl Chloride Polymer Tubing.

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

**UNITED STATES TESTING COMPANY**  
 Report of Test #83413.

FSC 5970

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(Application for copies should be addressed to Naval Shp Engineering Center, Code 6634C, Washington, D. C. 20360.)

UNIFORM CLASSIFICATION COMMITTEE  
Uniform Freight Classification Rules.

(Application for copies should be addressed to the Official Classification Committee, 1 Park Avenue, at 33rd Street, New York, N. Y. 10016.)

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

## 3. REQUIREMENTS

3.1 Qualification. - Electrical insulating material furnished under this specification shall be products which are qualified for listing on the applicable qualified products list at the time set for opening of bids (see 4.2 and 6.3).

3.2 Materials. -

3.2.1 Type P. - The resin, plasticizer, filler and coloring matter shall be formulated to comply with the requirements specified herein; the material shall fuse to tough, flexible non-porous coating at temperatures between 300°F. and 400°F. when applied to lead coated copper bars and to battery intercell connections.

3.2.2 Type T. - The tubing shall be of the heat reactive plastic type formulated to comply with the requirements specified herein. The tubing shall shrink to form a tough, flexible non-porous covering at temperatures between 275°F. and 300°F. when applied to lead coated copper bars.

3.3 Color. - The color of the type P material after heat curing shall be red in accordance with MIL-STD-104. The color of the type T material shall be black in accordance with MIL-STD-104.

3.4 Size. -

3.4.1 Type P. - Type P shall be furnished as a liquid in quantities as specified (see 5.2.1.1.1).

3.4.2 Type T. - Type T shall be furnished in sizes and wall thicknesses as follows:

<u>Bus Bar size</u> Inches	<u>Ordering Size</u>	<u>Lay flat width as shipped</u> Inch	<u>(Before reaction) Wall Thickness</u> Inches
1/4 x 2	BB200	2-7/8 ± 1/4	0.020 + 0.010 - 0.000
1/4 x 2-1/2	BB250	3-3/8 ± 1/4	
1/4 x 3	BB300	3-7/8 ± 1/4	
1/4 x 4	BB400	4-15/16 ± 3/8	0.023 + 0.010 - 0.000
1/4 x 5	BB500	5-15/16 ± 3/8	
1/4 x 6	BB600	7 ± 1/2	

3.5 Property values. - Standard specimens of the material shall conform to the property values shown in tables II (qualification) and IV (batch acceptance).

3.6 Instructions for use. - Each roll, can or pail shall have a label attached thereto covering the method of application including preparation of surface, precautions in handling, cure time and temperature, build.

3.7 Workmanship. - The plastic insulating materials shall be manufactured in a careful and workmanlike manner.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. - Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.2 Qualification tests.<sup>1/</sup> - Qualification tests shall be conducted at a laboratory satisfactory to the Naval Ship Engineering Center. Samples of material shall be furnished in quantities shown in table I. Qualification tests shall consist of the tests specified in table II.

Table I - Sizes and quantities of material for qualification tests.

Type	Size	Amount
P	-	1 gallon
T	each	5 feet, lineal

#### 4.3 Sampling for batch inspection. -

4.3.1 Lot. - All material of the same composition, type, and size manufactured under essentially the same conditions within a period of 15 days and offered for delivery at the same time shall be considered a lot for purposes of quality conformance inspection.

4.3.2 Sampling for examination. - Samples of materials shall be selected from each lot for examination of visual and dimensional characteristics in accordance with table III. The lot size and sample size shall be stated in terms of rolls or containers.

4.3.3 Sampling for quality conformance tests. - One fifth of the rolls or containers selected for the visual or dimensional examination shall be subjected to the quality conformance tests specified in table IV; however, the smallest number of rolls or containers selected for any sample shall be two. If the contract calls for delivery of 50 feet (or 5 gallons) or less, only one roll or package shall be selected.

Table II - Qualification tests for property values of insulation.

Property to be tested	Test paragraph	Number of specimens for each size and type	-1 Tests per specimen	+1 Conditioning (see 4.5)	Unit of value	-1 Property value
General examination <sup>1/</sup>	4.6.1	(see table I)	-	A	-	-
Dielectric strength <sup>2/</sup>	4.6.2	1	3	D <sub>t</sub> -24/23 <sup>3/</sup>	Minimum volts per mil	250
Insulation resistance	4.6.3	1	3	D <sub>t</sub> -24/23 <sup>3/</sup>	Minimum megohms	200
Impact	4.6.4	1	3	A	-	No damage
Abrasion resistance	4.6.5	1	3	A	Maximum grams per 1000 revolutions	0.05

<sup>1/</sup> Application for qualification tests shall be made in accordance with "Provisions Governing Qualification" (see 6.3 and 6.4).

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Table II - Qualification tests for property values of insulation. (continued)

Property to be tested	Test paragraph	Number of specimens for each size and type	-1 Tests per specimen	+1 Conditioning (see 4.5)	Unit of value	-1 Property value
Heat resistance	4.6.6	1	3	E-1/2/120	Maximum inches	0.025
plastic flow					Percent swelling	2.0 max.
Acid resistance	4.6.7	1	1	D <sub>S</sub> -46/70 <sup>4/</sup>	Exudation of plasticiser or other material deposited as sticky oily film on surface of specimen	None
Flame resistance	4.6.8	1	3	A	Minimum seconds	50
Ignition time					Maximum seconds	75
Burning time					Maximum percent	25
Weight loss					Maximum parts per million	15,000
Toxicity when heated:	4.6.9	1	3	A		
Carbon dioxide						1,500
Carbon monoxide						500
Ammonia						50
Aldehydes						1,100
Hydrogen chloride						100
Sulphur dioxide						60
Hydrogen cyanide						100
Oxides of nitrogen						

<sup>1/</sup> Materials, dimensions, and workmanship.<sup>2/</sup> Short time.<sup>3/</sup> Immersion in 1 percent salt water for the time and temperature shown.<sup>4/</sup> Immersion in 20 percent sulphuric acid for the time and temperature shown.

Table III - Sampling for examination.

Lot size number of rolls or containers	Sample size rolls or containers to be examined	Acceptance number (defective)	Rejection number (defective)
2 to 8	2	0	1
9 to 15	3	0	1
16 to 25	5	0	1
26 to 40	7	0	1
41 to 65	10	0	1
66 to 110	15	0	1
111 to 180	20	1	2

Table IV - Quality conformance tests for property values of insulation.

Property to be tested	Test paragraph	Number of specimens for each size and type	Tests per specimen	Conditioning (see 4.5)	Unit of value	Property value
General examination <sup>1/</sup>	4.6.1	<u>3/</u>	-	A	-	-
Dielectric strength <sup>2/</sup>	4.6.2	<u>3/</u>	3	D <sub>t</sub> -24/23	Minimum volts per mil	250
Insulation resistance	4.6.3	<u>3/</u>	3	D <sub>t</sub> -24/23	Minimum megohms	200
Acid resistance	4.6.7	<u>3/</u>	1	D <sub>s</sub> -46/70 <sup>4/</sup>	Percent swelling Exudation of Plasticizer or other material deposited as sticky oily film on surface of specimen	2.0 max. None

<sup>1/</sup> Materials, dimensions, and workmanship

<sup>2/</sup> Short time.

<sup>3/</sup> As required by lot size (see 4.3.3).

<sup>4/</sup> Immersion in 20 percent sulphuric acid for the time and temperature shown.

#### 4.4 Quality conformance inspection. -

4.4.1 Examination. - Each of the samples selected in accordance with 4.3.2 shall be visually and dimensionally examined to verify compliance with the requirements of 3.3, 3.4, 3.6 and 3.7. Any sample roll or container having one or more visual or dimensional defects shall be considered defective, and if the number of defective rolls or containers exceeds the acceptance number for the sample, this shall be cause for rejection of the lot represented by the sample. In the case of rolls, the outer layer of the rolls shall be discarded and the next five linear feet shall be examined.

4.4.2 Quality conformance tests. - Quality conformance tests shall be conducted on samples of material selected in accordance with 4.3.3. Two linear feet from each roll or one quart from each container shall be subjected to the tests specified in table IV. Results shall be averaged for each sample roll or container

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represented to determine conformance with this specification. If the average for any sample roll or container fails to conform with any requirement, this shall be cause for rejection of the lot.

4.5 Conditioning. - Materials shall be conditioned before being tested, as specified in table II or IV, as applicable.

4.5.1 Equipment. - Conditioning chambers and baths shall be such as to maintain the specified temperature plus or minus 2°C. and the specified relative humidity plus or minus 2 percent.

4.5.2 Designation. - Conditioning procedures shall be designated as follows:

- (a) A capital letter indicating the general condition of the specimen; that is humidity, immersion, and temperature conditioning.
- (b) A number indicating in hours the duration of the conditioning.
- (c) A number indicating in degrees centigrade the conditioning temperature.
- (d) A number indicating relative humidity whenever relative humidity is controlled. (Relative humidity obtained over calcium chloride shall be taken as zero.)

The number shall be separated from each other by slant marks, and from the capital letter by a dash.

4.5.3 Nomenclature. - The following letters shall be used to indicate the respective general conditioning:

Condition A - as received; no special conditioning.

Condition C - The specimens shall be conditioned for the time and at the temperature and relative humidity specified in tables II and IV, as applicable.

Examples:

C-96/23/0 - 96 hours, 23°C., 0 percent relative humidity

C-96/23/50 - 96 hours, 23°C., 50 percent relative humidity

C-96/23/96 - 96 hours, 23°C., 96 percent relative humidity

Condition D<sub>t</sub> - The specimen shall be immersed in 1 percent salt water for the time and at the temperature specified

Example:

D<sub>t</sub> - 24/23 - 24 hours, 23°C., in 1 percent salt water

Condition E - The specimen shall be conditioned for the time and at the temperature specified.

Examples:

E-400/100 - 400 hours, 100°C.

E-2/100 - 2 hours, 100°C.

E-400/130 - 400 hours, 130°C.

4.6 Methods of tests. - The methods and procedures shall be as specified in 4.6.1 to 4.6.9, inclusive. Unless otherwise specified herein, all tests shall be conducted under room conditions (23°C, 50 percent relative humidity).

4.6.1 General examination. -

4.6.1.1 The insulation shall be examined to verify that the materials, dimensions, labeling and workmanship are in strict conformance with this specification. (See 3.2 through 3.4 and 3.6, and 3.7.) Each sample filled container of type P selected in accordance with 4.3.2 shall be examined for defects of construction of the container and the closure, for evidence of leakage, for markings, and any other requirements not involving tests. Any defective container in the sample shall not be offered for delivery. If the number of defective filled containers in the sample exceeds the acceptance number for the appropriate sample plan of MIL-STD-105, this shall be cause for rejection of the lot represented by the sample.

4.6.1.2 Methods for measurement of dimensions. -

4.6.1.2.1 Wall thickness (Type T). - The wall thickness of the tubing shall be determined in accordance with the method specified in ASTM D876. The inside diameter, however, may be determined by measuring the diameter of the mandrel adjacent to the edge of the tubing specimen by use of a chisel point micrometer. The inside diameter, the outside diameter, and wall thickness shall be measured at a minimum of 10 representative points along the length of the sample. At each point three measurements approximately 120 degrees apart shall be made of the outside diameter. The average inside diameter and outside diameter shall be reported, and the average wall thickness shall be reported as one-half the difference of the two averages.

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4.6.1.2.2 Width (type T). - The width shall be determined by the use of a standard steel scale graduated to read in 1/16 inch. The tubing shall be pressed flat on a smooth surface at the time of measurement. At least 10 measurements shall be made at representative points on the material, and the maximum, minimum, and average values shall be recorded.

4.6.1.3 Color. - Color of the insulation in its applied form shall be checked to determine compliance with MIL-STD-104.

4.6.2 Dielectric strength. -

4.6.2.1 Method of measurement. - Dielectric strength shall be determined in accordance with the method specified in ASTM D149. The power supply shall consist of an alternating-current source having as nearly a true sine wave as possible at a frequency of 60 + 5 cycles per second. The application of voltage shall be made using the short-time method with a rate of rise of 1000 volts per second.

4.6.2.2 Test electrodes. -

4.6.2.2.1 Type P. - A fused coating of approximately 0.030 inch thickness shall be applied to a copper bus bar 1/4 inch thick and 4 inches wide. Three specimens shall be prepared. One end shall be sealed and immersed to a depth of 4 inches in a 1 percent salt water solution. Voltage shall be applied between copper bar and the salt water. Breakdown shall occur through the coating and not the seal. The voltage per mil of thickness shall be determined by dividing the breakdown voltage through the coating by the thickness of the coating. The actual thickness of coating shall be determined after breakdown and adjacent to the breakdown area. The average dielectric breakdown expressed in volts as well as the average dielectric strength in volts per mil shall be reported.

4.6.2.2.2 Type T. - Tubing shall be applied by heat reaction to copper bus bars. Three specimens shall be prepared for each size. One end of each specimen shall be sealed and immersed to a depth of 4 inches in a 1 percent salt water solution. Voltage shall be applied between copper bar and salt water solution. Breakdown shall occur through the tubing and not the seal. The voltage per mil of thickness shall be determined by dividing the breakdown voltage through the coating by the thickness of the coating. The average thickness of the coating shall be determined as specified in 4.6.1.2.1.

4.6.3 Insulation resistance. - Insulation resistance shall be determined in accordance with the method specified in ASTM D257. The specimens used may be the same ones as prepared for the dielectric strength tests and may be tested prior to the dielectric tests. Samples and immersion testing shall be under the same condition as detailed in 4.6.2.2.1 and 4.6.2.2.2.

4.6.4 Impact. - The effect of impact shall be determined by dropping a 5-1/2 pound cylindrical weight with a 5/8 inch hemispherical end from a height of 12 inches onto an insulated bus bar. The thickness of insulation shall be 0.030 + .005 inches. Three determinations shall be made.

4.6.5 Abrasion resistance. - Abrasion wear (loss of weight) shall be determined in accordance with method 109I.1 of FED-STD-406. Three determinations shall be made. Calibrase wheels, CS-10 with a load of 1000 grams shall be used. At least 5000 cycles shall be made.

4.6.6 Heat resistance, plastic flow. - A sample of material 0.100 + 0.010 inch thick and not less than 1-inch wide shall be placed between the anvil and the special presser foot of a thickness micrometer conforming to that described in method 2021 of FED-STD-601. A 100-gram weight shall be added to the 3-ounce weight and after one minute initial thickness shall be read. The micrometer and the specimen under load shall be placed in an oven for 30 minutes at 120 + 0.5°C. The final thickness shall be read within 30 seconds after removal from the oven. Plastic flow to the nearest 0.001 inch shall be the difference between the initial and final thickness measurements. Three determinations shall be made. In the case of type T material the test specimen for this test must consist of preshrunk material and may consist of several plies in order to achieve the required thickness.

4.6.7 Acid resistance. - Acid resistance shall be determined in accordance with method 6211 of FED-STD-601. Specimens shall be immersed in a 20 percent by weight sulphuric acid solution for 46 + 1/4 hours at 70 + 1°C.

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4.6.8 Flame resistance. - Flame resistance shall be determined in accordance with the method described in United States Testing Company Report #83413. Specimens shall be 0.125 + .005 inch wall thickness build on 1/4 inch steel rods. 5-inch lengths shall be tested.

4.6.9 Toxicity when heated. - The method of test and sample size shall be the same as described for the flame resistance test (see 4.6.8).

## 5. PREPARATION FOR DELIVERY

5.1 Domestic shipment and early equipment installation. -

5.1.1 Packaging. - Packaging, which may be the supplier's commercial practice, shall be sufficient to afford adequate protection against corrosion, deterioration and physical damage during shipment from the supply source to the using activity and until early installation.

5.1.2 Packing. - Packing shall be accomplished in a manner which will insure acceptance by common carrier at the lowest rate and will afford protection against physical or mechanical damage during direct shipment from the supply source to the using activity for early installation. The shipping containers or method of packing shall conform to the Uniform Freight Classification Ratings, Rules and Regulations or other carrier regulations as applicable to the mode of transportation and may conform to the suppliers commercial practice.

5.1.3 Marking. - Shipment marking information shall be provided on interior packages and exterior shipping containers in accordance with the contractor's commercial practice. The information shall include nomenclature, Federal stock number or manufacturer's part number, contract or order number, contractor's name and destination.

(5.2 Domestic shipment and storage or overseas shipment. - The requirements and levels of packaging, packing and marking for shipment shall be specified by the procuring activity (see 6.2).

5.2.1 Packaging. - Packaging shall be level A or C as specified (see 6.2).

5.2.1.1 Level A. -

5.2.1.1.1 Type P. - The insulation compound shall be furnished in 1-gallon multiple friction plug type cans or in 5-gallon lug cover steel pails as specified (see 6.2).

5.2.1.1.1.1 Cans. - Cans shall conform to type V, class 2, round, of PPP-C-96. Exterior plan B coating and side seam stripping shall be required. Cans shall be provided with wire handles which shall be galvanized or protectively coated to resist corrosion.

5.2.1.1.1.2 Pails. - The 5-gallon pails shall conform to type II of PPP-P-704. Wire bales shall be zinc-coated or otherwise protectively coated to resist corrosion.

5.2.1.1.2 Type T. - The insulation tubing shall be furnished in lay flat coils of 100 foot lengths. Each coil shall be wrapped in 30-pound basis weight (24 x 36-500) kraft gusseted bag, sealed with pressure sensitive tape.

5.2.1.2 Level C. - Insulation shall be packaged in accordance with the suppliers commercial practice.

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

5.2.2.1 Levels A and B. -

5.2.2.1.1 Cans. - Cans shall be arranged and packaged for overseas shipment in accordance with the appendix to PPP-C-96. Cans packed in tiers shall have a W6 (PPP-B-636) fiberboard pad placed between the tiers.

5.2.2.1.2 Pails. - The 5-gallon pails will require no additional packing. When specified (see 6.2) pails shall be palletized in accordance with MIL-STD-147.

5.2.2.1.3 Coils. - Coils shall be packed in fiberboard boxes, class 2, in accordance with PPP-B-636.



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5.2.2.2 Level C. - Insulation shall be packed in a manner which will insure carrier acceptance and safe delivery at destination. Shipping containers or method of packing shall comply with the Uniform Freight Classification Rules and Regulations or other carrier regulations as applicable to the mode of transportation.

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

5.2.3.1 Hazardous chemicals. - All packages containing hazardous chemicals (see 3.6) shall have securely affixed thereto such warning labels and markings as required by the Interstate Commerce Commission CFR Title 49, part 71-78 and the Manufacturing Chemists Association Manual L-1.)

## 6. NOTES

6.1 Intended use. - This insulation is intended for covering bus bars, primarily on submarines, where a flame resistant, tough, non-porous, good dielectric covering is needed. The type P material provides a build of approximately 0.050 to 0.060 inches and the type T material provides a wall thickness after reaction of approximately 0.030 to 0.035 inches. This insulation shall not be used in applications where the continuous operating hot spot temperature exceeds 105°C. (221°F.); any shot time, higher temperature and for the time cycle involved before use. Instructions for applying these materials to submarine battery bus bars and connectors is contained in the appendix to this specification.

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

- (a) Title, number, and date of this specification.
- (b) Type required (see 1.2).
- (c) Size for type T (see 3.4.2).
- (d) Quantity of compound required (see 5.2.1.1.1).
- (e) Palletized pails, if required (see 5.1.1.2).
- (f) Packaging, packing or marking requirements other than those required by paragraph 5.1 (see 5.2).

6.3 With respect to products requiring qualification, awards will be made only for products which are at the time set for opening of bids, qualified for inclusion in Qualified Products List QPL 15265. The attention of the suppliers is called to this requirement, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification, in order that they may be eligible to be awarded contracts or orders for the products covered by this specification. The activity responsible for the qualified products list is the Naval Ship Engineering Center, Department of the Navy, Washington 25, D. C. 20360, and information pertaining to qualification of products may be obtained from that activity. Application for Qualification tests shall be made in accordance with "Provisions Governing Qualification" (see 6.4).

6.4 Copies of "Provisions Governing Qualification" may be obtained upon application to Commanding Officer, Naval Supply Depot, 5801 Tabor Avenue, Philadelphia, Pennsylvania 19120.

6.5 Certain provisions of this specification are the subject of international agreements (ABC-NAVY-STD-17). When amendment, revision or cancellation of this specification is proposed, the departmental custodians will inform their respective Departmental Standardization Offices so that appropriate action may be taken respecting the International agreement concerned.

6.6 **CHANGES FROM PREVIOUS ISSUE. THE EXTENT OF CHANGES (DELETIONS, ADDITIONS, ETC.) PRECLUDE THE ANNOTATION OF THE INDIVIDUAL CHANGES FROM THE PREVIOUS ISSUE OF THIS DOCUMENT.**

International interest (see section 6).

Preparing activity:  
Navy - SH  
(Project 5970-N065Sh)

## APPENDIX

## APPLICATION INSTRUCTIONS (SUBMARINE BUS BARS)

## 10. SCOPE

10.1 This appendix covers instructions for applying plastic insulation to submarine bus bars and inter-cell connections.

## 20. APPLICABLE DOCUMENTS

20.1 The following documents, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

## SPECIFICATIONS

## FEDERAL

O-T-634 - Trichloroethylene, Technical.

P-D-680 - Dry Cleaning Solvent.

## DRAWINGS

## BUREAU OF SHIPS

9000-S6202-73980 - Electric Plant Installations, Standard Methods, Section 5 - Submarines.

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

## 30. REQUIREMENTS

30.1 Surface preparation. - It is most important to remove all sharp edges, burrs and sharp projections on bus bar, terminal posts, bolts and nuts with a file and sandpaper or crocus cloth, removing the minimum amount of metal. Renew all damaged nuts and bolts. All bolts must be of the same length.

30.2 Cleaning. - Place bus bars in a vapor degreaser and clean. Solvent used in cleaning operation should consist of 9 parts of dry cleaning solvent in accordance with P-D-680 (Stoddard Solvent) and 1 part trichloroethylene in accordance with O-T-634. After cleaning, all bus bars should be handled only with clean cotton gloves. Any oil or grease on surfaces to be insulated will result in failure of the coating to adhere.

30.3 Parts to be insulated. - The center portion of the cell connectors shall be insulated with type P or type T material. All remaining exposed parts of cell connectors, terminal posts, bolts, washers, and securing nuts are to be insulated with slip-on caps using type P material.

30.3.1 Cell connectors, bus bar section. -

30.3.1.1 Marking the center portion. - Handling the cleaned bus bar cell connector with clean cotton gloves, mark off 2 to 2-1/16 inches from each end.

30.3.1.2 Primer for type P. - Apply an adhesive primer to the central portion of the bus bars and allow to air dry at room temperature for 20 minutes.

30.3.1.3 Applying type P. - Suspend the primed bus bar in an oven preheated to 190°C. (375°F.) and heat for about 15 minutes or until the part has attained oven temperature. Prolonged heating or heating at too high a temperature may destroy the primer. Remove the heated bar and dip quickly into the type P compound to within 2 inches of the upper end of the bar. Keep the bar immersed for 30 seconds, withdraw slowly and return immediately to a preheated oven. Bake for 12 minutes at 190°C. (375°F.) to fuse the dipped coating. A change in color and slight "smoking" of the coating also indicates complete fusing. Remove from the oven and hang the bar up until cool. Type P coating should be about 0.60 to 0.70 inch thick. Cut through the coating, 2 to 2-1/16 inch from each end and strip off the excess resin. Pill box holes should be reopened.

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30.3.1.4 Applying type T. - Cut a length of the required size of type T material and slip over the center portion of the clean bus bar. Place in an oven and heat for 30 minutes at 150°C. (302°F.) or until contraction has occurred. The type T coating should be about 0.030 to 0.35 inch thick. A second tube shall be applied in the same manner until a wall thickness of about 0.60 to 0.70 inch thick is obtained. Cut through the coatings, 2 to 2-1/16 inch from each end and slip off the excess tubing. Extreme care should be exercised in cutting and trimming the tubing to the desired length on the bus bar. Utilize a sharp knife or blade and cut the tubing in smooth continuous strokes. Avoid irregular cuts or nicks when trimming the edges and faces of the bus bars. Position tubing so that bolting, clamping, or other forces do not pinch, cut or similarly stress tubing.

30.3.2 Cell connectors, slip-on caps. -

30.3.2.1 Molds. - The mold for the slip-on caps should be made from a free-machining low carbon steel (such as SAE-1020) in such form and dimensions to produce caps in accordance with 9000-S6202-73980, section 5, sheets 141 and 152.

30.3.2.2 Applying type P. - The molds should be lightly coated with a mold release agent, heated to 190°C. (375°F.), removed from the oven and while hot dipped quickly into type P compound. Keep the mold immersed for a timed period of 30 seconds, withdraw slowly and return to a preheated oven. Bake for 10 to 15 minutes at 190°C. (375°F.) or until the coating is completely fused.

30.3.2.3 Removal of cap. - Remove mold and cap from oven and cool by immersing in water. With a sharp knife cut the plastisol from what is the bottom of the slip-on cap. The bottom will be on opposite edges of the mold for each half of the total number of slip-on caps. Remove cap from mold by loosening the part over the bolt heads first.

## 40. QUALITY ASSURANCE PROVISIONS

40.1 Responsibility for inspection. - Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

40.2 Insulation suitability tests. - Insulation suitability tests shall be conducted on insulated bus bar and slip-on caps. Sampling shall be in accordance with table III with a lot size being the number of bus bars or caps. The tests shall consist of the quality conformance tests listed in table IV. As the dielectric strength tests are destructive, samples for test shall be over and beyond what is needed for a specific application. For the dielectric test the bus bar end shall be cut off and sealed before immersion and the slip-on cap shall be filled with lead shot and immersed on the diagonal so as to cover at least one bolt head portion of the cap.

## 50. PREPARATION FOR DELIVERY

50.1 Preparation for delivery shall be as specified by the procuring activity.

## 60. NOTES

60.1 This section is not applicable to this specification.