NOTE: DOD-STD-2003-2 has been redesignated as a standard practice. The cover page has been changed for Administrative reasons. There are no other changes to this Document.

INCH - POUND

DOD-STD-2003-2(SH)
24 June 1987
SUPERSEDING
NAVSEA S9300-AW-EDG-010/EPISM
(INCLUDING NAVSEA DWG. NO.
803-5001027) AND NAVSEC NO.
9000-S6202-73980

DEPARTMENT OF DEFENSE
STANDARD PRACTICE

ELECTRIC PLANT INSTALLATION STANDARD METHODS FOR SURFACE SHIPS AND SUBMARINES (EQUIPMENT)

SECTION 2 OF 5 SECTIONS

AMSC N/A

AREA GDRQ

DISTRIBUTION STATEMENT B. Distribution limited to U.S. Government agencies only for administrative and operational use. Other requests for this directive must be referred to NAVSEA (SEA 05Q).

SECTION 2

EQUIPMENT

DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND
Washington, DC 20362-5101

Electric Plant Installation Standard Methods for Surface Ships and Submarines

1. This Military Standard 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.

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.

FOREWORD

1. The criteria contained herein for the installation of the electrical plant on ships of the United States Navy supersede the data contained in Sections 1 through 5 of NAVSHIPS Drawing 9000-S6202-73980, NAVSEA Drawing No. 803-5001027 and NAVSEA PUBLICATION S9300-AW-EDG-010/EPISM.

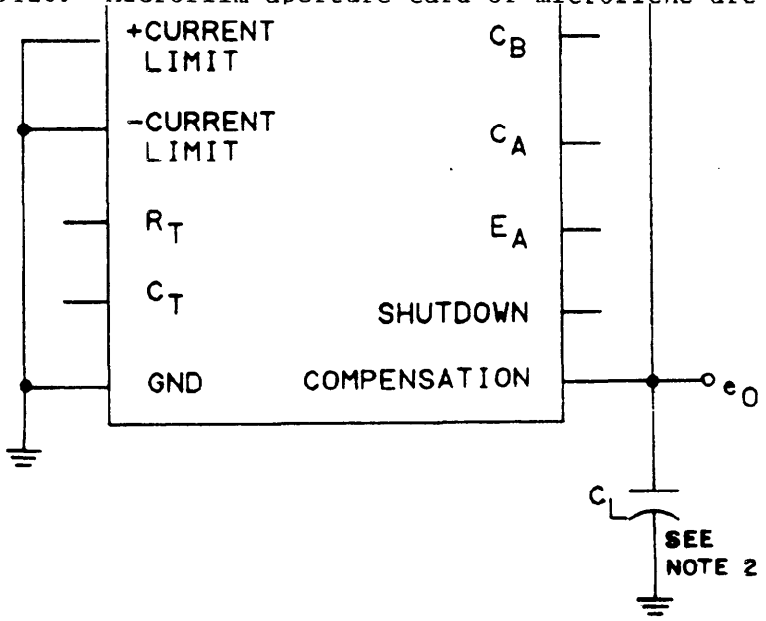
2. This standard disseminates up-to-date information detailing Requirements for Standard Installation Methods Employed for Submarine and Surface Ship Electrical Distribution Systems.

3. These criteria apply to work on a specific ship or ships only when invoked by the Ship Specifications or similar contractual documents.

4. Although these criteria are primarily for application to new construction, their use may be considered in the conversion or alteration of existing ships. In such cases the degree of applicability of these criteria will be specified by the activity preparing the instructions for the work.

5. Considering the magnitude of this standard, along with the changing requirements imposed on the Electric Plant, it is inevitable that changes will be required to up-date these criteria. Therefore, as comments arise they should be forwarded to Naval Sea Systems Command (NAVSEA) 55Z3 to keep this standard as current as possible through subsequent revisions. Revisions will be accomplished by the issuance of additional or revised figures to be inserted in the basic standard sections. Document Improvement Proposal Form DD 1426 attached. Superseded pages may be retained for reference if so desired.

6. This standard is available in a 8-1/2 X 11 hard copy, in microfilm aperture cards, or in microfiche. It is available in 8-1/2 X 11 hard copy from Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120. Microfilm aperture card or microfiche are available



W in measured by increasing signal frequency (starting at 100 kHz) ntil e_O = 20 $mV_{(P-P)}$.

e frequency at which this occurs is G_{BW}.
L) capacitance load = 20 pF, -10%, on e_O including scope probe and g capacitance.
ternate method: Set signal frequency (e_1) to the G_{BW} minimum limit $e_O \geq 20\ mV_{(P-P)}$ then G_{BW} is $\geq$ the minimum limit.

NOTES:
1. G_B u
Th
2. (C ji
3. Al if

CONTENTS

CONTENTS - Continued

Group A - Equipment Mounting

Group B - Switchboard Mounting

Group C - Battery Equipment

CONTENTS - Continued

Group C - Battery Equipment (Continued)

1. SCOPE

1.1 Purpose. The purpose of section 2 of DOD-STD-2003 is to disseminate up-to-date information for casualty power, shore power, electrical equipment and switchboards.

1.1.1 Application. These installation standards shall be used by all installing activities. These standards do not identify ship or type, but do establish minimum standards of acceptance for NAVSEA ships. It is the responsibility of the user activity to determine which standard satisfies their requirements. It does not authorize relaxation of any requirement specifically invoked by new construction, conversion, overhaul, or refurbishment contracts. In instances where deviated design requirements (for example, ship type, ship class, and so forth) conflict with the requirements of this standard, the requirements of this standard shall govern. Any deviation for electric plant installation identified in this standard shall be submitted to NAVSEA 56Z2 for resolution.

2. REFERENCED DOCUMENTS

2.1 Government documents.

2.1.1 Specification and standards. Unless otherwise specified, the following specification and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this standard to the extent specified herein.

SPECIFICATION

MILITARY
DOD-B-15072 - Batteries, Storage, Lead-Acid, Portable; General Specification for.

STANDARDS

FEDERAL
FED-STD-H28 - Screw-Thread Standards for Federal Services.

MILITARY
DOD-STD-2134 - Storage Battery Arrangement for Minimum Stray Magnetic Field.

(Copies of specifications and standards required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Order of precedence. In the event of a conflict between the text of this standard and the references cited herein, the text of this standard shall take precedence.

3. DEFINITIONS

Not applicable.

4. GENERAL REQUIREMENTS

4.1 Electrical equipment mounting. The installation of electrical equipment shall be in accordance with figures 2A1 through 2A22. Electrical equipment shall be secured in a manner that they do not come into direct contact with the outer shell plating or ballistic surfaces of the ship. A minimum clearance of 2 inches shall be maintained for inspection and painting. The mounting of electrical equipment on bulkheads subject to condensation, such as the outer surface of refrigerated space boundary bulkheads, shall be avoided. If no other location is feasible, the equipment shall be mounted at least 2 inches clear of such surfaces. Also, cable shall not be mounted in direct contact with such bulkheads, but shall use one of the wet location methods. When such surfaces are insulated, appropriate insulation methods shall be used for both equipment and cable. Where necessary to attach electrical equipment to decks or bulkheads within gun and missile blast areas, such equipment shall be mounted to provide a 2-inch minimum clearance between the structure and equipment and, moreover, such equipment shall be located clear of areas of maximum expected deflection or whip of bulkhead and deck plating in order to prevent breakage or pulling loose of mounting feet.

4.1.1 Installation welding requirements. Unless otherwise specified on the individual figure, the welding of studs, step hangers, tapped pads, mounting pads, extension hangers and top bracing supports for switchboards shall be in accordance with MIL-STD-278. Pads, studs, and so forth shall be tapped or threaded before being welded to the ship's structure.

4.1.2 Installation fasteners. Bolts, nuts, machine screws, flat and lock washers shall be of commercial grade and material specified. Threads shall be American-National firm, coarse series class 2, unless otherwise specified. Thread fastenings shall be as specified in FED-STD-H28. Locking devices shall be used for bolts mounting electrical equipment. Through bolts and self-locking nuts shall be used to mount equipment in gun mounts and in battery compartments above the level of the lowest cell tops.

4.1.3 Holes drilled in beams. Location of holes drilled in beams for passing cables or securing of supports or equipment shall be on or above the neutral axis.

4.1.4 Malleable iron castings. Malleable iron castings are not approved for any installation shown except as may be noted on the individual figure.

4.2 Switchboard mounting. Switchboard mounting and bracing shall be in accordance with figures 2B1 through 2B6. The base of each unit shall be adequately secured to the foundation and shall be in a level plane (with reference to ship's baseline) when secure. In order to ensure there is no warping of the switchboard framework or misalignment of component parts of the switchboard, the base of each section shall not be out-of-plane by more than 1/8 inch after installation, with all securing bolts tightened. Switchboards shall be located so that the base of the units can be bolted directly to the deck stiffeners, and not bolted to a thin deck plate. Foundation bolts of the switchboard units shall be fastened to metal whose thickness in the immediate vicinity of the bolts is at least equivalent to the bolt diameter. The addition of pads may be necessary to obtain the required thickness or to compensate for the lack of flanges on the deck stiffeners. The requirements regarding rigidity of the switchboard structure, the requirements for securing the units to the foundation, and for the foundation in the ship for mounting the switchboard are intended to ensure that the switchboard units after installation in the ship will not display unsatisfactory resonant vibrations. If the horizontal vibration of deck-mounted switchboard sections or switchboards exceeds 0.040-inch double amplitude, measured on the framework near the top of the structure, top bracing shall be provided. Rigidity of the braces and their attachments shall be adequate to prevent vibration of the top of the section, but the strength of the braces shall not exceed the limits of General Specifications for Ships of the United States Navy Section 073. Shear bolts may be employed in the braces if provision is made to prevent the brace from striking the section or bulkhead after shearing of the bolt. Horizontal braces are preferred. The angle of inclination of braces shall not exceed 45 degrees from the horizontal. The braces shall possess inherent flexibility in the vertical direction. Top bracing and installation features shall conform to the methods shown in this section. Bolts, nuts, and washers used to fasten the braces to the switchboard frame shall be held captive by suitable means. Unless other means of bracing are provided, sway bracing shall be provided front-to-back on all control centers and side-to-side on one-section and two-section control centers.

4.3 Storage batteries and servicing facilities. Storage batteries and service facilities shall be in accordance with figures 2C1 through 2C10. The required number of trays shall be connected in series to produce the required voltage. The necessary ampere-hour capacity shall be obtained by the use of the proper size of battery. Lead acid batteries may be connected in parallel in order to obtain greater capacities than those available from the largest sized battery. Alkaline batteries shall not be paralleled. Types of lead-acid storage batteries and their applications shall be as shown in table I. For engine starting, batteries shall be provided as necessary to meet the current, voltage, and duty cycle of the starting motor for each application. Contractor-furnished and Government-furnished batteries (except spares) shall be filled with electrolyte and charged by the contractor (in accordance with manufacturer's instructions for initial charging) not more than 30 days before Acceptance Trials (AT), except where required for prior tests of batteries and associated equipment. Batteries used in prior tests shall be brought up to full charge not more than 30 days before AT. Battery records shall be kept which indicate the battery function, the Navy type designation, the specification type, the initial charging date, and the dates of subsequent charges or other maintenance actions.

TABLE I. Classes and applications of portable lead storage batteries.

Navy type designation	Spec. sheet no. DOD-B-15072	Typical uses
2V-20AH-L/D-A	/3	Portable floodlights.
12V-15AH-L/D-A or B	/11	Gyros and emergency communications on submarines.
6V-50AH-L/D-A or B 12V-50AH-L/D-A or B	/9 /9	Dial telephone systems having a capacity of 50 lines or less, interior communication, gyro-compass emergency power.
6V-100AH-L/D-A or B 8V-100AH-L/D-A or B 12V-100AH-L/D-A or B	/12 /12 /12	All purposes mentioned 50AH type and for gun firing, and sight lighting circuits, director instrument illumination, fire control instrument illumination, radio power, and 100 or 150 line telephone systems.
6V-130AH-H/S-A or B 8V-130AH-H/S-A or B 12V-130AH-H/S-A or B	/13 /13 /13	Engine starting services.
6V-205AH-H/S-A or B 8V-205AH-H/S-A or B	/10 /10	Engine starting services requiring greater capacity than 130 AH.
6V-300AH-L/D-A or B 8V-300AH-L/D-A or B	/14 /14	General service emergency batteries, electronic, and dial telephone systems having a capacity of more than 150 lines.

NOTE:

V = Battery nominal voltage
AH = Ampere hour capacity
L/D = Low rate/deep discharge cycling
H/S = High rate/shallow discharge cycling
A or B indicates normal, A, or reversed, B, intercell connector arrangement for stray magnetic field reduction

4.3.1 Storage batteries - tray and rack installation. Trays shall be installed to be readily accessible for testing, watering and cleaning. Spacing of trays shall ensure effective ventilation. Clearance above trays shall be not less than 12 inches. Battery trays and racks (open and enclosed) shall be in accordance with figures 2C1 through 2C11. Where racks cannot be adequately secured to the deck and bulkhead, they shall be additionally secured by diagonal braces to the deck above, but in no case shall the vertical support extend from deck to deck. Spaces assigned for storage and service of spare batteries shall have sufficient shelf space or racks for storage of all spare batteries. Separate storage spaces shall be provided for alkaline batteries. On minesweepers, mine tenders, mine hunters, and similar type ships designed for low magnetic signature, where it is required to reduce to a minimum the stray magnetic field produced by the current through batteries and connections to them, arrangement and connections shall be as shown in DOD-STD-2134.

4.4 Casualty power. The casualty power distribution system installation shall be in accordance with figures 2D1 through 2D7. These figures depict the installation requirements for horizontal bulkhead terminals, vertical risers, portable jumper cable, cable stowage racks, terminals mounted in equipment enclosures, terminal wiring, installation and end preparation of casualty power cable. The following equipment and cable types shall be used for casualty power installations:

Bulkhead terminals	-	Symbol 1046 and 1048
Riser terminals	-	Symbol 1047
Plugs	-	Symbol 1049
Cable stowage racks	-	
Permanent riser cable	-	TSGU-75
Portable cable	-	THOF-42

4.5 Shore power. Receptacles and cables associated with shore power facilities for surface ships shall be in accordance with the installation methods shown in figures 2E1 through 2E23. These figures depict the configuration of shore power stations inside and outside bulkheads, mounting of connection boxes, incline mounted shore power receptacles in protected areas, free standing shore power stations, details of in-line connectors on alongside power cables, portable cable jumper assemblies, termination and potting of plugs, termination and heat shrink boot requirements for in-line connectors, installation details for receptacles, typical shore power cable supports, repair and mounting of terminal boxes, and the repair and preparation of shore power cables.

5. DETAILED REQUIREMENTS

SEE FIGURES

6. NOTES

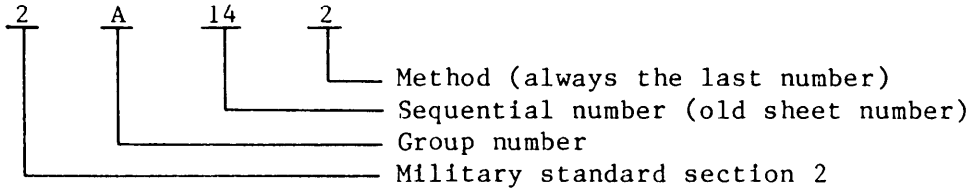
6.1 Intended use. This section specifies the requirements for equipment mounting, switchboard mounting, battery equipment, casualty power and shore power methods to be employed both on surface ships and submarines. Standard methods identified for electric plant installation are intended for new construction only.

6.2 Designation of electric plant installation standard methods figures. The electric plant installation standard method DOD-STD-2003-2 contains drawings that depict Standard Methods that are applicable for general electric plant installation on both surface ships and submarines. Standard Methods shown on the individual sheets of Drawing 803-5001027 have been assigned a figure number in this standard. The methods shown on the figures are grouped together providing similar functions. These groups are:

DOD-STD-2003-2 (Equipment) Group
- A. Equipment mounting
- B. Switchboard mounting
- C. Battery equipment
- D. Casualty power
- E. Shore power

The methods shown on the figures are identified by the following alpha-numeric designation system:

METHOD 2A142



Thus, method 2A142 identifies method 2, sequential number 14 in group A of DOD-STD-2003-2.

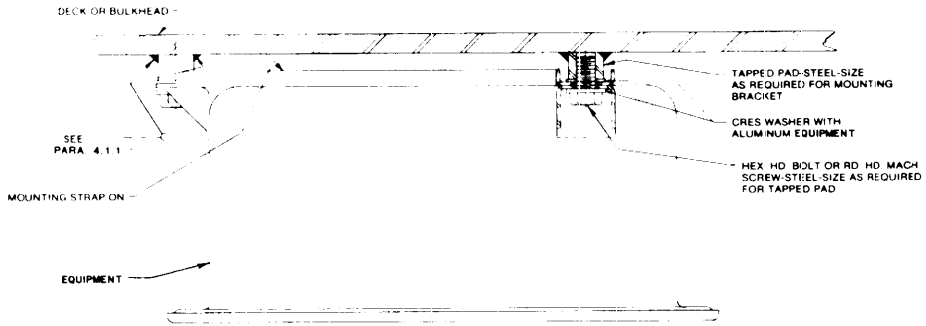
6.3 Subject term (key word) listing.

Equipment mounting
Switchboard mounting
Battery equipment
Casualty power
Shore power

Preparing activity:
Navy - SH
(Project GDRQ-N066-2)

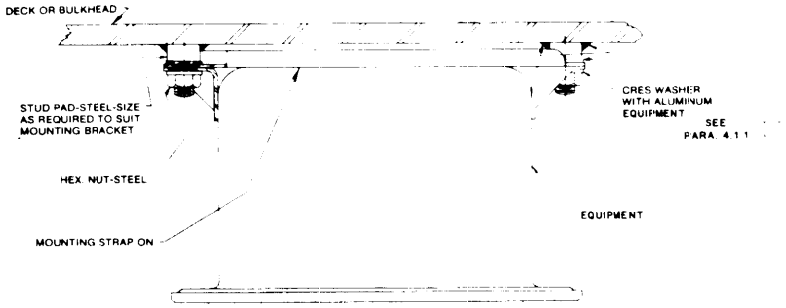
2A11

SECURING EQUIPMENT
TO DECKS OR BULKHEADS WITHOUT INSULATION
USING TAPPED PADS



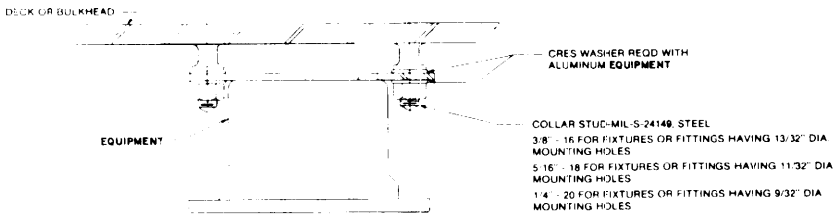
2A12

SECURING EQUIPMENT
TO DECKS OR BULKHEADS WITHOUT INSULATION
USING STUD PADS



2A13

SECURING EQUIPMENT
TO DECKS OR BULKHEADS WITHOUT INSULATION
USING COLLAR STUDS



NOTES:

1. THIS FIGURE SUPERSEDES SHEET 2A1 OF DRAWING 803-5001027 AND SECTION 3, SHEET 33, SECTION 4, SHEET 55 OF DRAWING NAVSEC NO. 9000-S6202-73980

SH 132317011

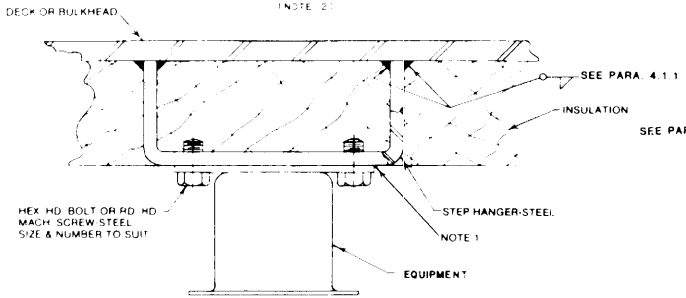
FIGURE 2A1. Equipment secured to watertight steel decks of bulkheads.

NOTES:

1. CRES WASHERS ARE REQUIRED WHEN EQUIPMENT MATERIAL IS ALUMINUM.
2. METHODS 2A21 & 2A22 MAY BE USED WHEN BULKHEADS OR DECKS ARE S.T.S.
3. THIS FIGURE SUPERSEDES SHEET 2A2 OF DRAWING 803-5001027 AND SECTION 3, SHEET 8 & 9 AND SECTION 4, SHEET 55 OF DRAWING NAVSEC NO. 9000-S6202-73980.

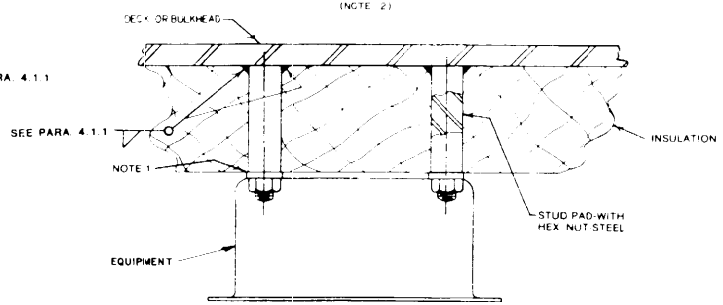
2A21

EQUIPMENT SECURED TO EXTENSION HANGER WITH TAPPED HOLES



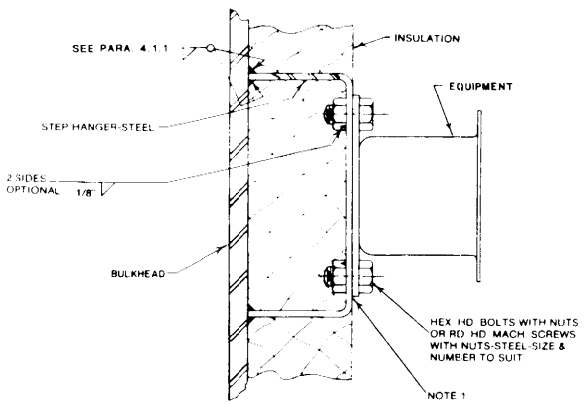
2A22

EQUIPMENT SECURED TO LONG STUD PADS



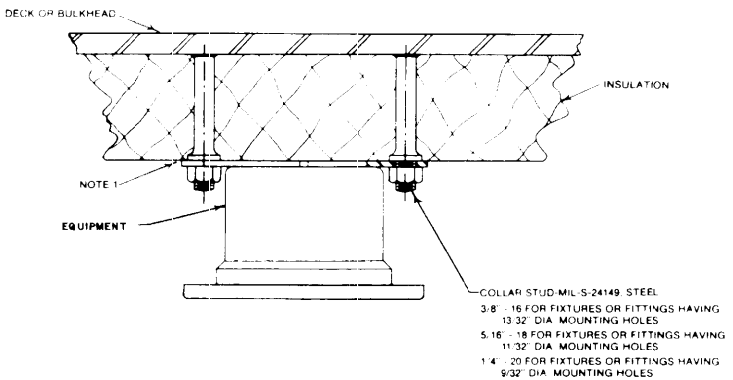
2A23

EQUIPMENT SECURED TO EXTENSION HANGER WITH THROUGH BOLTS



2A24

DECKS OR BULKHEADS WITH INSULATION EQUIPMENT SECURED WITH COLLAR STUDS

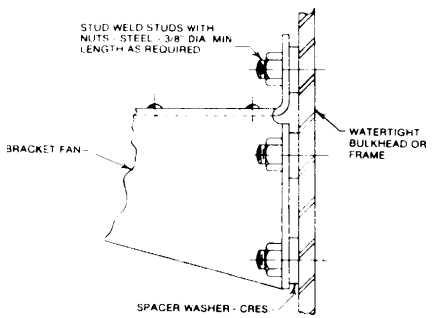


SH 132317012

FIGURE 2A2. Equipment mounted on insulated watertight steel deck or bulkhead.

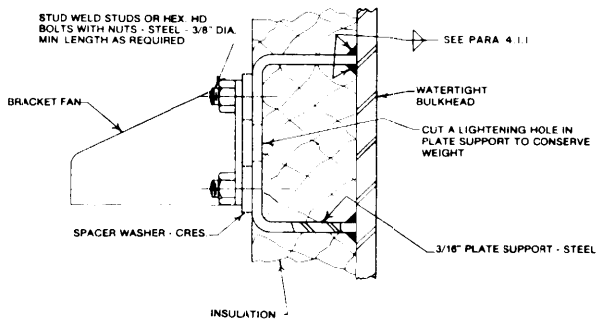
2A31

FAN SUPPORTED ON BULKHEADS
FAN SHOWN SECURED BY STUD WELD STUDS



2A32

FAN SUPPORTED AWAY FROM SHIP'S STRUCTURE
FOR BULKHEADS WITH INSULATION
OR TO AVOID AN OBSTRUCTION

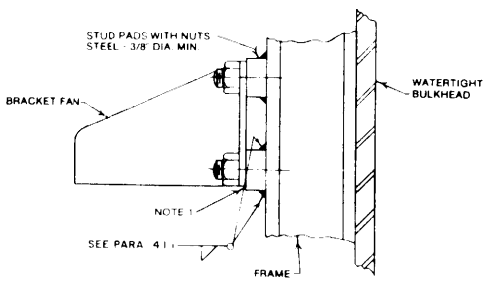


NOTES:

1. CRES WASHERS REQUIRED WHEN MATERIAL OF FAN BRACKETS IS ALUMINUM.
2. THIS FIGURE SUPERSEDES SHEET 2A3 OF DRAWING 803-5001027 AND SECTION 3, SHEET 14 & 15 OF DRAWING NAVSEC NO. 803-S6202 -73980

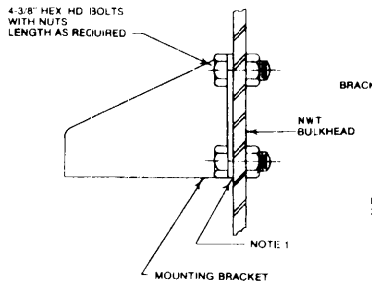
2A33

FAN SUPPORTED ON A FRAME
FAN SHOWN SECURED BY STUD PADS



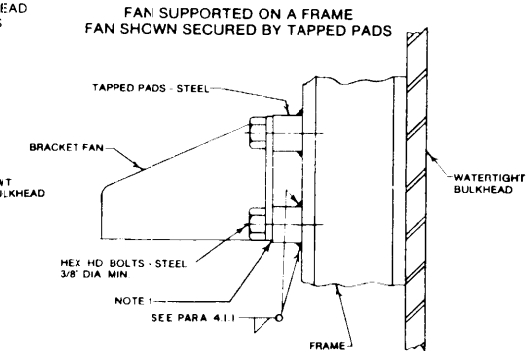
2A34

FAN MOUNT ON NON-WATERTIGHT BULKHEAD
FAN SHOWN SECURED BY FOUR BOLTS



2A35

FAN SUPPORTED ON A FRAME
FAN SHOWN SECURED BY TAPPED PADS



SH 132317013

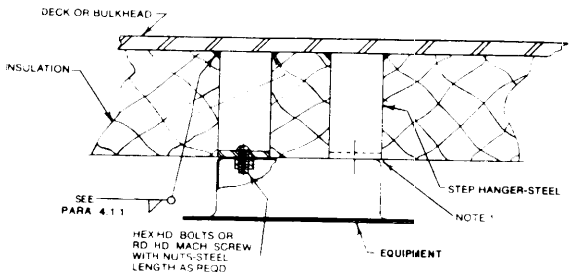
FIGURE 2A3. Bracket fans supported on steel bulkheads.

NOTES:

1. CRES WASHERS TO BE USED AS SPACERS WHEN EQUIPMENT MATERIAL IS ALUMINUM.
2. THIS FIGURE SUPERSEDES SHEET 2A4OF DRAWING 803-5001027 AND SECTION 3, SHEET 4, & SECTION 5, SHEET 96, OF DRAWING, NAVSEC NO. 9000-S6202-73980.

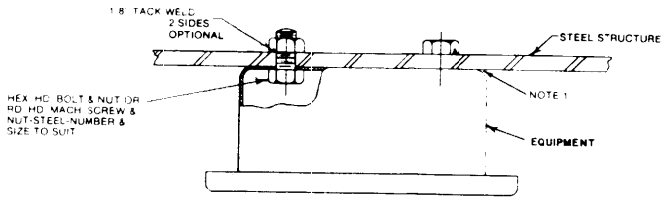
2A41

EQUIPMENT
SECURED TO DECKS OR BULKHEADS
WITH INSULATION



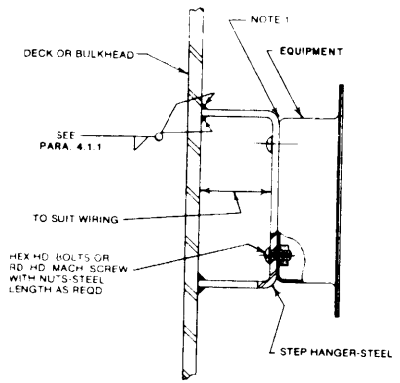
2A42

EQUIPMENT
SECURED TO STEEL STRUCTURE
WITHOUT INSULATION



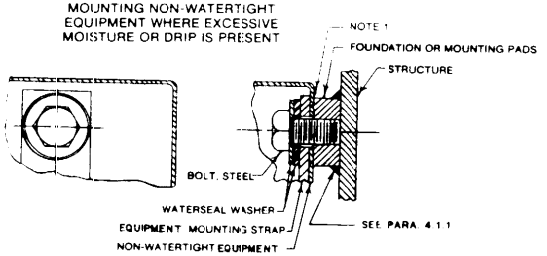
2A43

EQUIPMENT
SECURED TO DECKS OR BULKHEADS
WITHOUT INSULATION
USING EXTENSION HANGER TO CLEAR AN OBSTRUCTION



2A44

MOUNTING NON-WATERTIGHT
EQUIPMENT WHERE EXCESSIVE
MOISTURE OR DRIP IS PRESENT



WATERSEAL WASHER TABLE

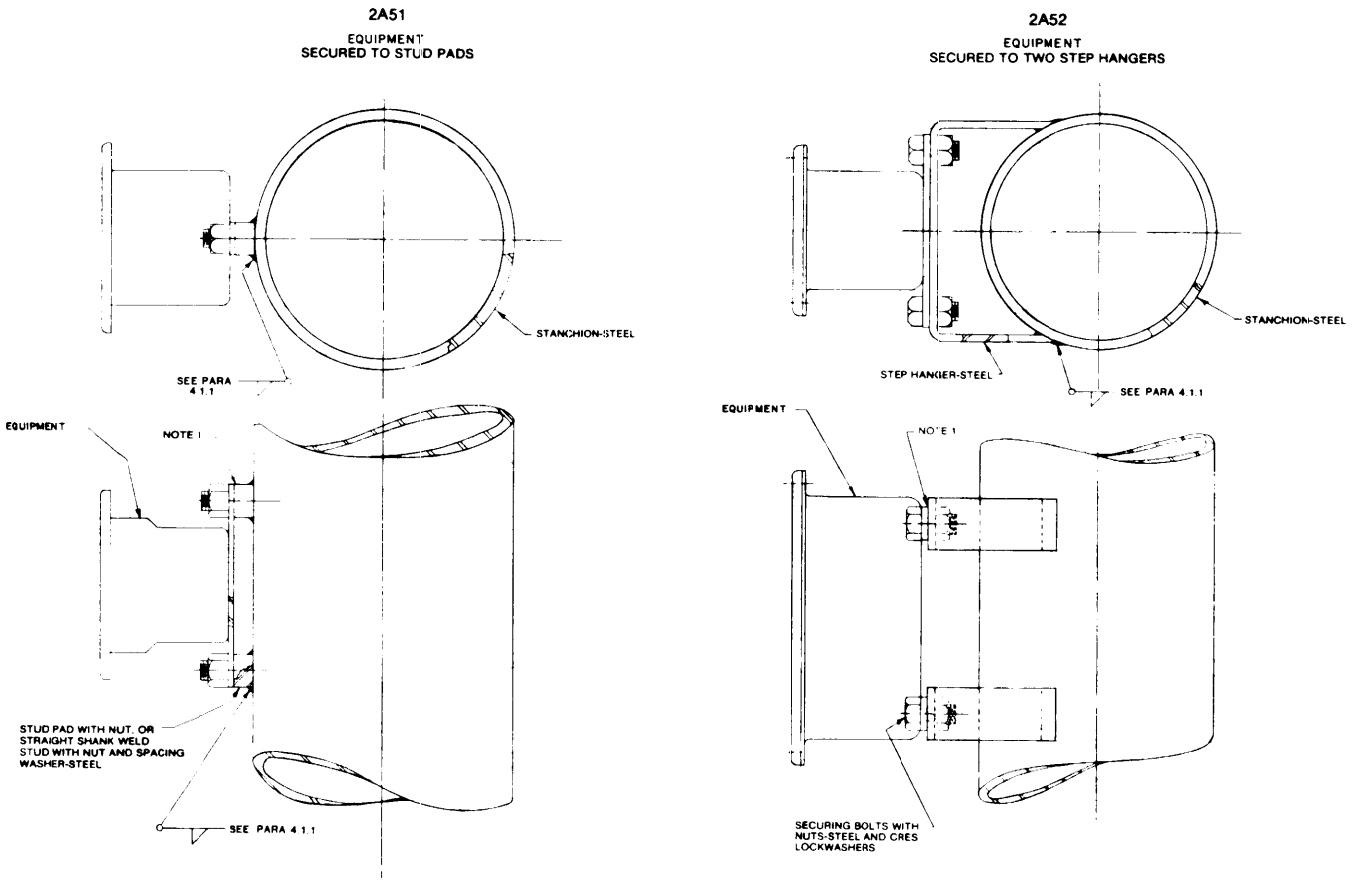
MOUNTING	Metal Portion - STAINLESS STEEL			Rubber Portion - NEOPRENE		
BOLT	O.D	I.D	THICKNESS	O.D	I.D	THICKNESS
1/4	.729	.3583	.0299	.8125	.1875	.0825 TO .0837
3/8	.875	.5	.0299	.9375	.2812	.0825 TO .0837
1/2	1.1875	.5468	.0299	1.250	.4062	.0825 TO .0837
5/8	1.5625	.750	.0359	1.875	.5	.0825 TO .0837
3/4	1.90625	.882	.0359	2.0312	.625	.0825 TO .0837

SH 132317014

FIGURE 2A4. Equipment secured to non-watertight steel decks or bulkheads.

NOTES:

1. CRES WASHERS ARE TO BE USED AS SPACERS WHEN EQUIPMENT MATERIAL IS ALUMINUM.
2. THIS FIGURE SUPERSEDES SHEET 2A5 OF DRAWING 803-5001027 AND SECTION 3, SHEET 12 DRAWING NAVSEC NO. 9000-S6202-73980.



SH 132317015

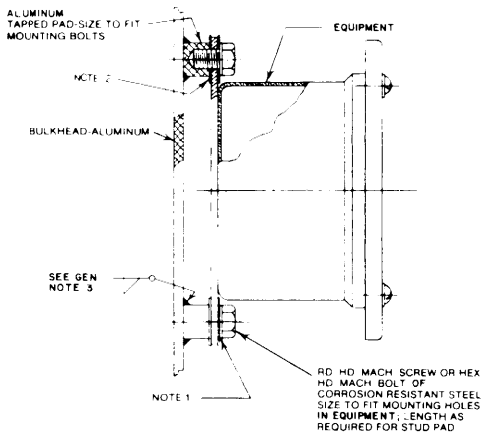
FIGURE 2A5. Equipment secured to steel stanchions.

NOTES

1. CRES WASHERS SHALL BE USED WHEN EQUIPMENT MATERIAL IS STEEL OR BRASS.
2. CRES WASHERS SHALL BE USED WHEN STUD PAD IS ALUMINUM AND EQUIPMENT IS STEEL OR BRASS.
3. APPLY GASKET JOINT SEALING PACKING MATERIAL PER MIL-J-2629 ON WATERTIGHT BULKHEADS.
4. THIS FIGURE SUPERSEDES SHEET 2A6 OF DRAWING 803-5001027 AND SECTION 3, SHEET 2 & 5, AND SECTION 4, SHEET 55 OF DRAWING, NAVSEC NO. 9000-S6202-73980.

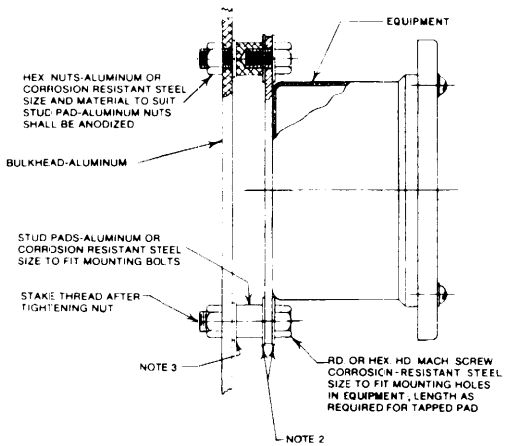
2A61

EQUIPMENT SECURED TO TAPPED PADS WELDED TO BULKHEAD



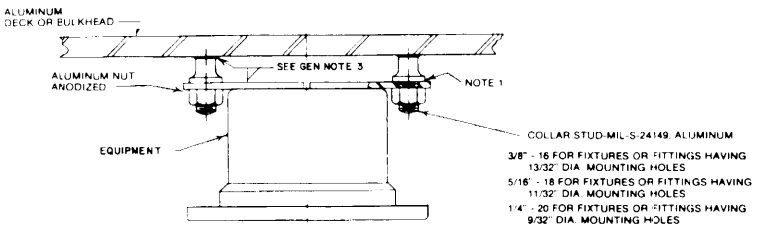
2A62

EQUIPMENT SECURED TO STUD PADS BOLTED TO BULKHEAD



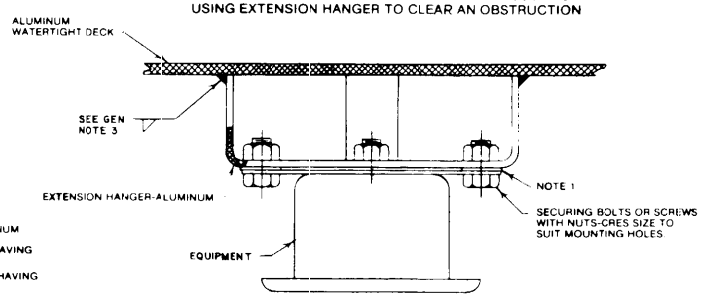
2A63

DECKS OR BULKHEADS WITHOUT INSULATION
EQUIPMENT
SECURED WITH COLLAR STUDS



2A64

EQUIPMENT
SECURED TO WATERTIGHT DECKS WITHOUT INSULATION
USING EXTENSION HANGER TO CLEAR AN OBSTRUCTION

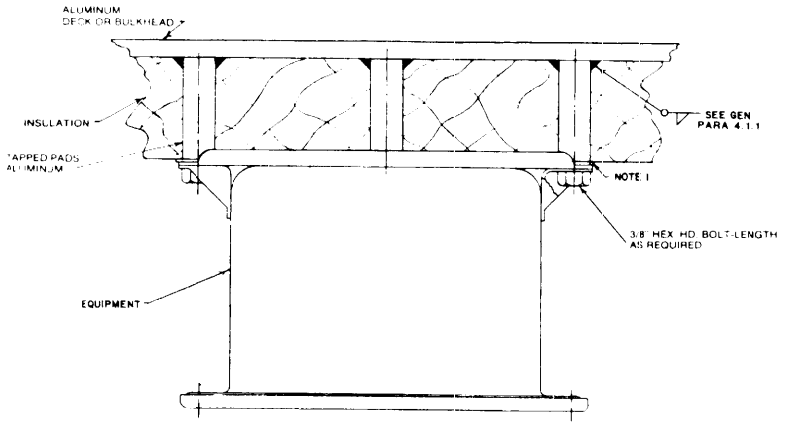


SH 132317016

FIGURE 2A6. Equipment mounted on aluminum bulkheads.

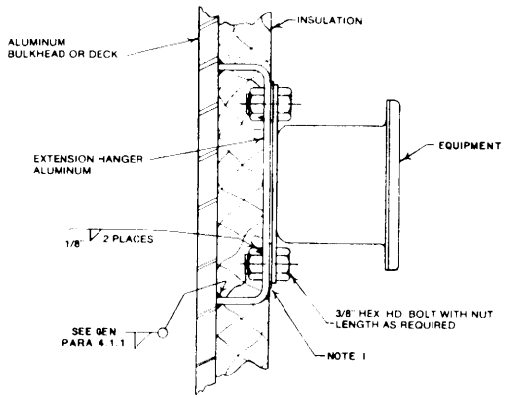
2A71

EQUIPMENT SECURED TO
DECKS OR BULKHEADS WITH INSULATION
USING TAPPED PADS



2A72

EQUIPMENT SECURED TO
DECKS OR BULKHEADS WITH INSULATION
USING EXTENSION HANGERS

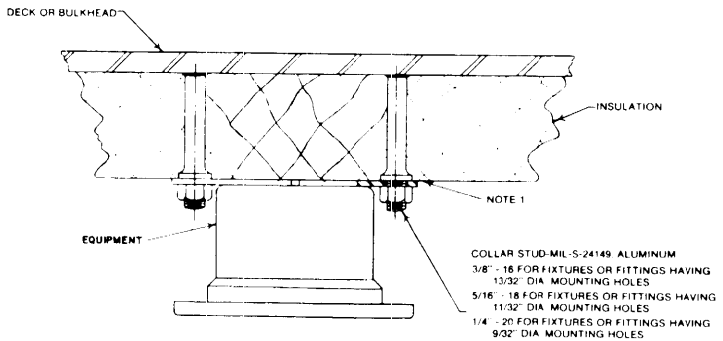


NOTES:

1. CRES WASHERS SHALL BE USED WHEN EQUIPMENT MATERIAL IS STEEL.
2. THIS FIGURE SUPERSEDES SHEET 2A7 OF DRAWING 803-5001027 AND SECTION 3, SHEET 6 & SECTION 6, SHEET 55 OF DRAWING NAVSEA NO. 9000-S6202-73980.

2A73

DECKS OR BULKHEADS WITH INSULATION
EQUIPMENT
SECURED WITH COLLAR STUDS



SH 132317017

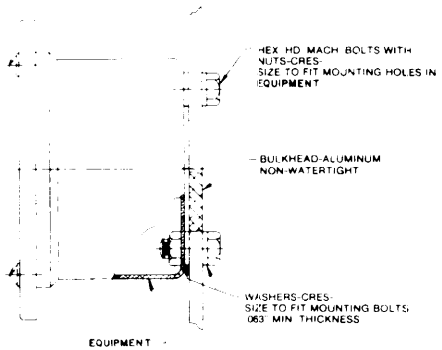
FIGURE 2A7. Equipment mounted on insulated aluminum decks or bulkheads.

NOTES:

1. CRES WASHERS SHALL BE USED AS SPACERS WHEN EQUIPMENT MATERIAL IS STEEL OR BRASS.
2. THIS FIGURE SUPERSEDES SHEET 2A8 OF DRAWING 803-5001027 AND SECTION 3, SHEET 1 & 5 OF DRAWING NAVSEC NO. 9000-S6202-73980.

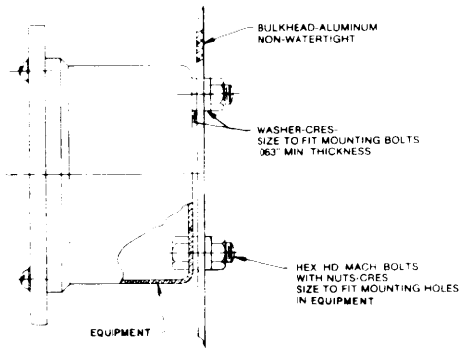
2A81

EQUIPMENT SECURED TO BULKHEADS 3/16" THICK AND OVER



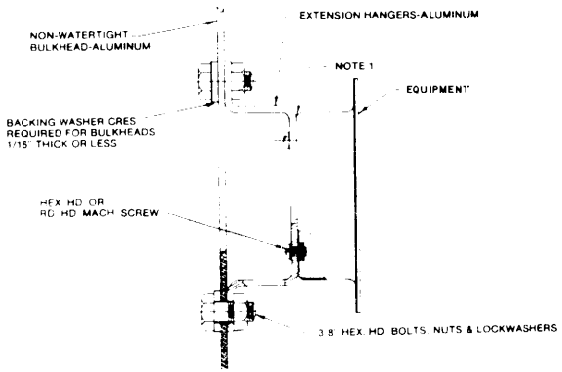
2A82

EQUIPMENT SECURED TO BULKHEADS UNDER 3/16" THICK



2A83

EQUIPMENT SECURED TO NON-WATERTIGHT BULKHEAD USING EXTENSION HANGER TO CLEAR AN OBSTRUCTION



SH 132317018

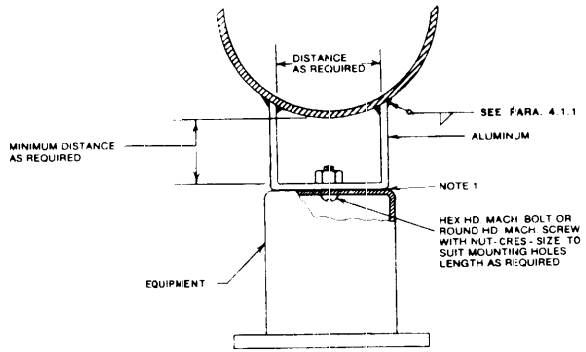
FIGURE 2A8. Equipment mounted on non-watertight aluminum decks and bulkheads.

NOTES:

1. CRES WASHERS SHALL BE USED AS SPACERS WHEN EQUIPMENT MATERIAL IS STEEL OR BRASS.
2. THIS FIGURE SUPERSEDES SHEET 2A9 OF DRAWING 803-5001027 AND SECTION 3, SHEET 13 OF DRAWING NAVSEC NO. 9000-S6202-73980.

2A91

EQUIPMENT
SECURED TO ALUMINUM STANCHIONS &
BULKHEADS LESS THAN 3/16" THICK



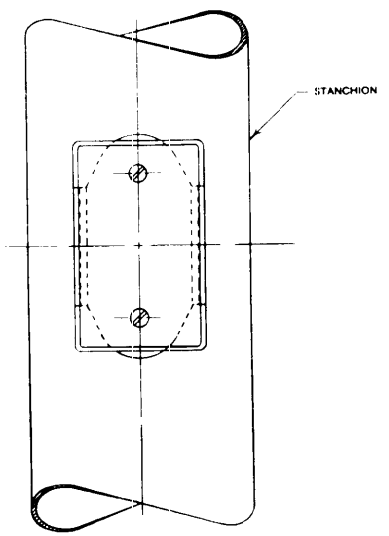
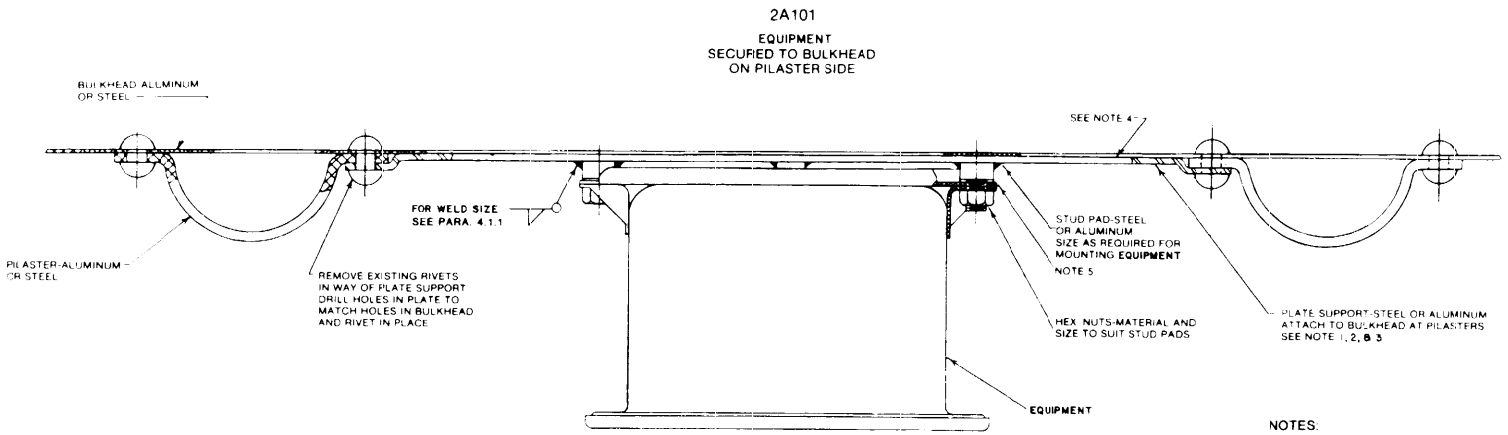


FIGURE 2A9. Equipment mounted on aluminum stanchions.

SH 132317019

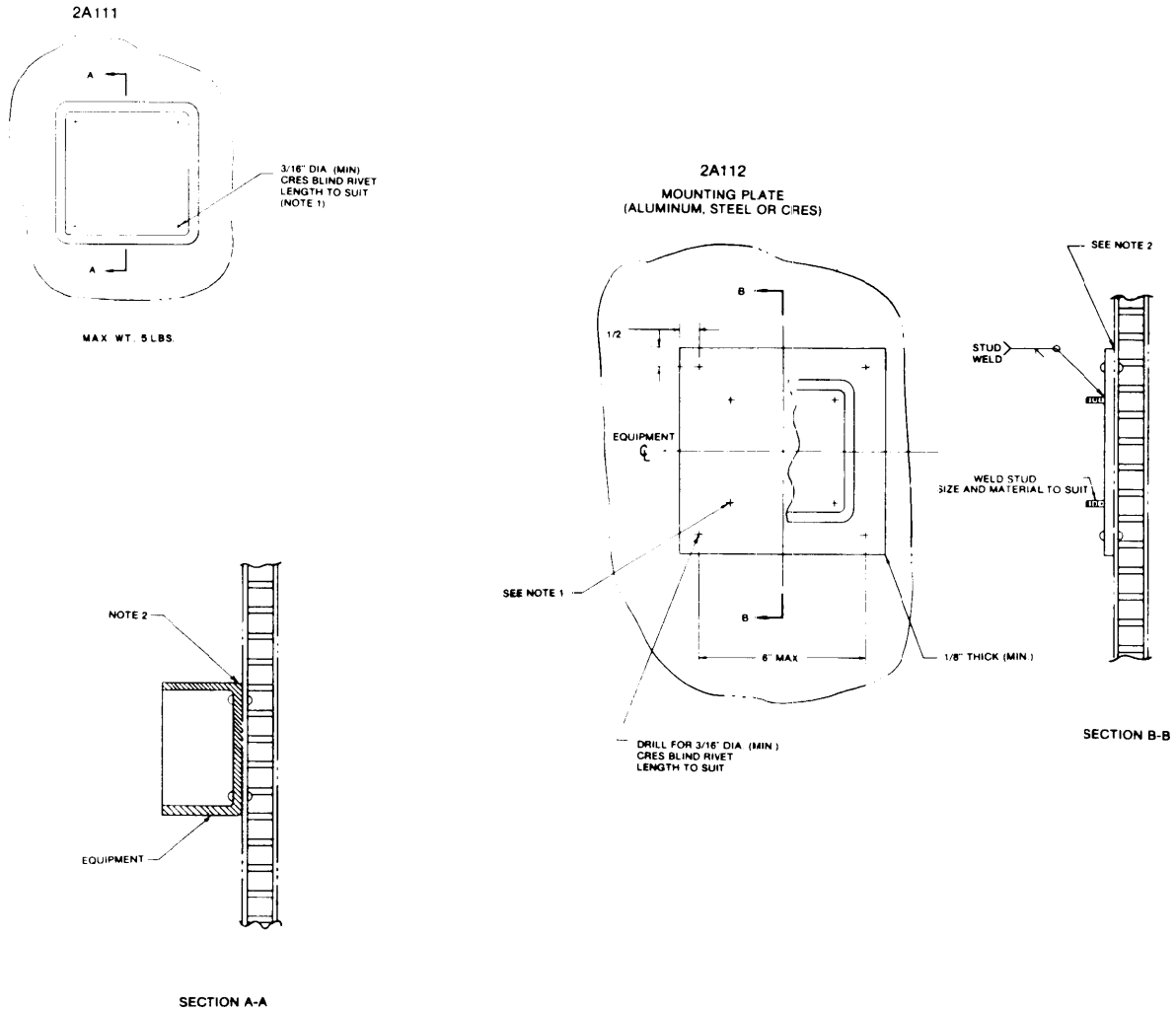


NOTES:

1. PLATE SUPPORT IS NOT REQUIRED EXCEPT WHEN EQUIPMENT TO BE MOUNTED IS GREATER THAN 6"x9" OR WEIGHS 15 LBS OR MORE.
2. STEEL PLATE SUPPORTS SHALL BE USED WHEN ATTACHING BRASS EQUIPMENT.
3. ALUMINUM PLATE SUPPORTS MAY BE USED WHEN ATTACHING ALUMINUM OR STEEL EQUIPMENT.
4. APPLY TWO COATS OF ZIC CHROMATE PRIMER BETWEEN FAYING SURFACE OF BULKHEAD AND PLATE SUPPORT.
5. CRES WASHERS SHALL BE USED AS SPACERS WHEN STUD PAD AND EQUIPMENT ARE OF DISSIMILAR METAL.
6. THIS FIGURE SUPERSEDES SHEET 2A10 OF DRAWING 803-5001027.

FIGURE 2A10. Equipment mounted on aluminum or steel plaster bulkheads.

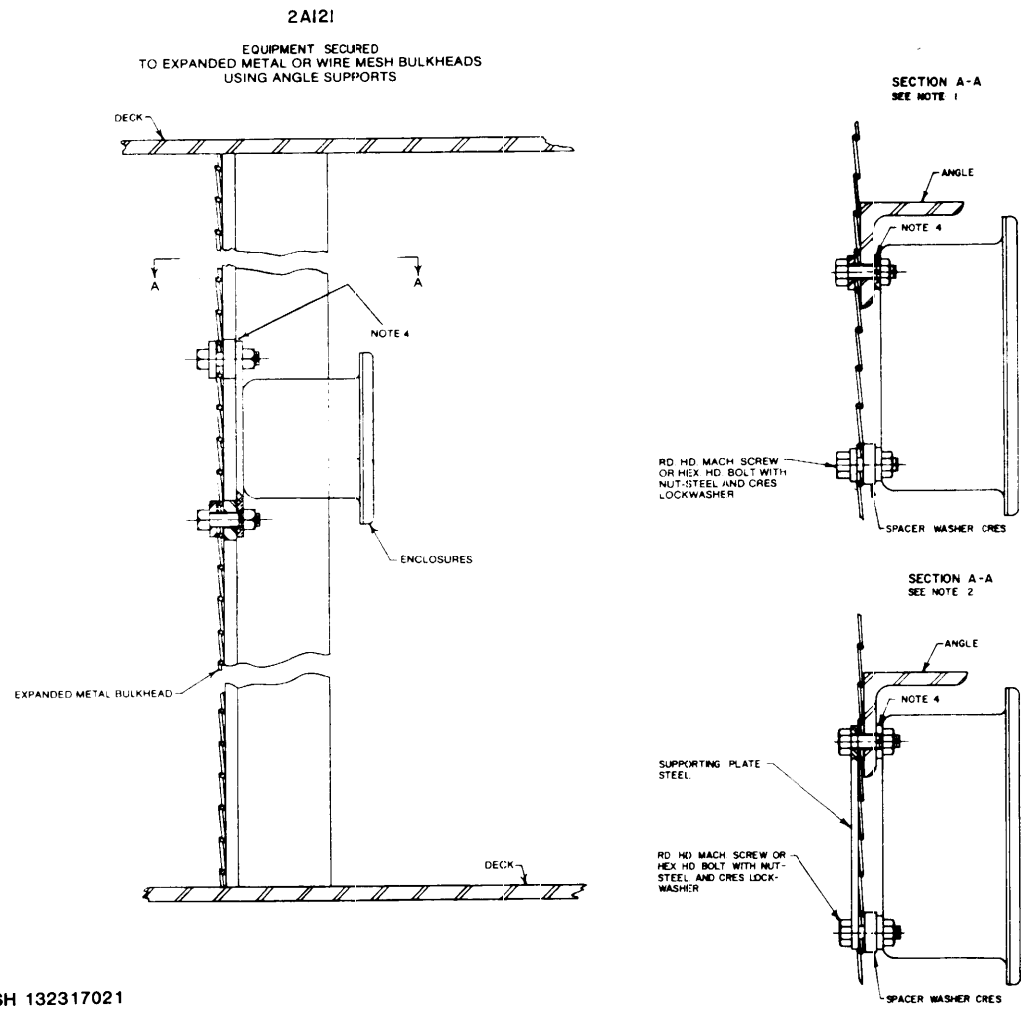
SH. 13231796



NOTES:
1. LOCATION OF MOUNTING HOLES TO BE TEMPLATED FROM UNIT BEING INSTALLED.
2. ALL FAYING SURFACES OF ALUMINUM TO DISSIMILAR METAL TO BE PROTECTED WITH ONE LAYER OF SCOTCH WRAPED NO. 22 TAPE MINNESOTA MINING AND MFG CO OR EQUAL.
3. THIS FIGURE SUPERSEDES SHEET 2A11 OF DRAWING 803-5001027.

SH 132317020

FIGURE 2A11. Equipment mounted on metal joiner bulkheads.



SH 132317021

NOTES:

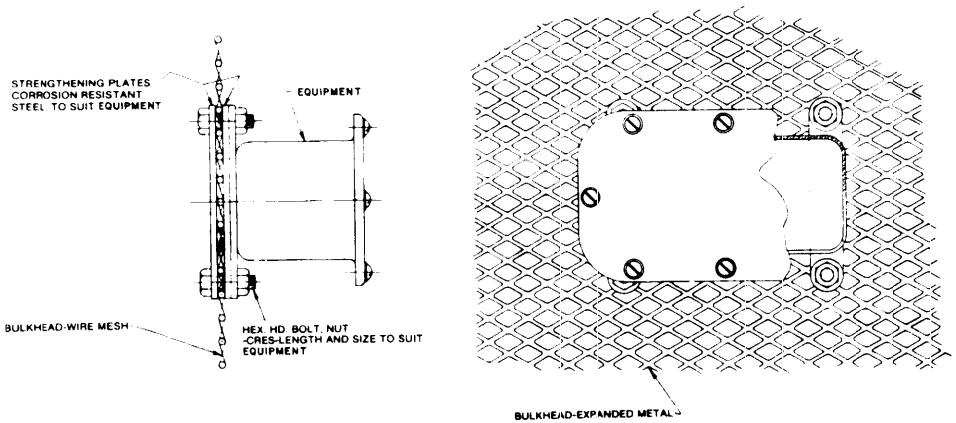
1. METHOD SHOWN IS FOR COMPONETS UP TO 10 LBS
2. METHOD FOR APPLIANCES OVER 10 LBS AND UP TO 30 LBS USE BACKING PLATES EXTENDED TO ANGLE SUPPORT FOR MESH BACKING PLATES TO BE 1/8" STEEL.
3. NO APPLIANCES ARE TO BE MOUNTED ON PORTABLE SECTIONS OF EXPANDED METAL BULKKHEADS. EXCEPT SMALL FIXTURES WHICH MAY EASILY BE MOVED AND WHICH MUST BE ATTACHED THERE TO FOR EFFICIENT OPERATION.
4. CRES WASHERS SHALL BE USED AS A SPACER WHEN ENCLOSURE MATERIAL IS ALUMINUM AND ANGLES ARE STEEL.
5. THIS FIGURE SUPERSEDES SHEET 2A12 OF DRAWING 803-5001027 AND SECTION 3, SHEET 65 OF DRAWING, NAVSEC NO. 9000-S6202-73980.

FIGURE 2A12. Equipment mounted on expanded metal or wire mesh bulkheads.

NOTES:
1. THIS FIGURE SUPERSEDES SHEET 2A13 OF DRAWING 803-5001027 AND SECTION 3, SHEET 64 OF DRAWING NAVSEC NO. 9000-S6202-73980.

2A131

EQUIPMENT SECURED
TO EXPANDED METAL OR WIRE MESH BULKHEADS

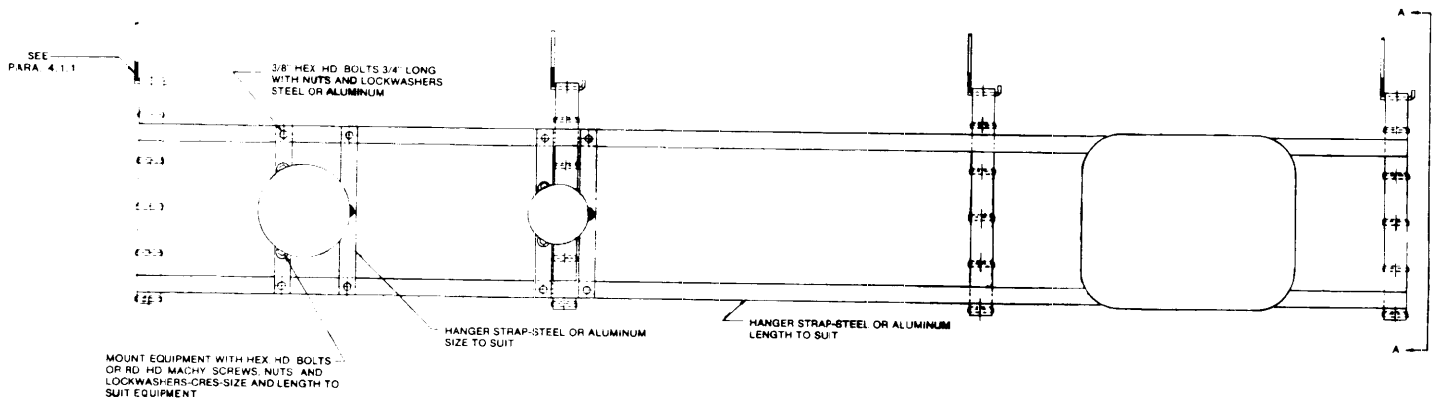


SH 132317022

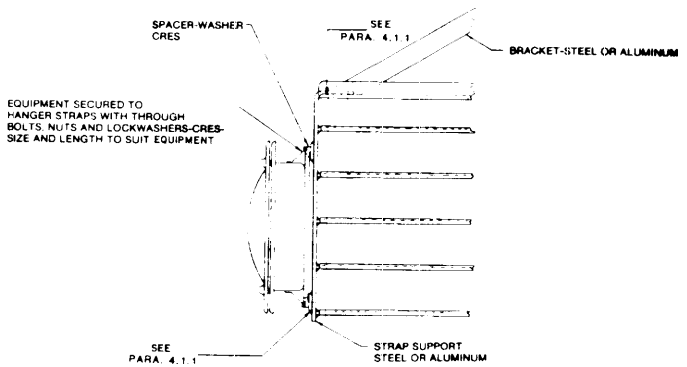
FIGURE 2A13. Equipment mounted on expanded metal or wire mesh bulkhead.

2A141

EQUIPMENT MOUNTED
ON CABLE RACKS
APPLICABLE TO BULKHEAD RUNS IN MAIN CABLEWAYS,
IN MACHINERY SPACES, AND PASSAGES



ELEVATION
SECTION "A-A"



SH 132317023

NOTES:
1. THE WEIGHT OF ANY PARTICULAR PIECE OR GROUP OF ELECTRICAL EQUIPMENT SECURED TO CABLE RACK WILL BE LIMITED TO 25 LBS MAXIMUM ON STEEL AND 10 LBS MAXIMUM ON ALUMINUM RACKS.
2. LOCATION OF EQUIPMENT TO BE SO ARRANGED THAT IT WILL NOT INTERFERE WITH INSPECTION AND PAINTING.
3. THIS METHOD IS INTENDED FOR USE IN ISOLATED CASES ONLY.
4. THIS FIGURE SUPERSEDES SHEET 2A14 OF DRAWING 803-5001027 AND SECTION 3, SHEET 66 OF DRAWING NAVSEC NO. 9000-S6202-73980.

FIGURE 2A14. Equipment mounted on cabling racks.

NOTES:
1. THIS FIGURE SUPERSEDES SHEET 2A15 OF DRAWING 803-5001027 AND SECTION 3, SHEET 16 OF DRAWING NAVSEC NO. 8000-S6202-73980.

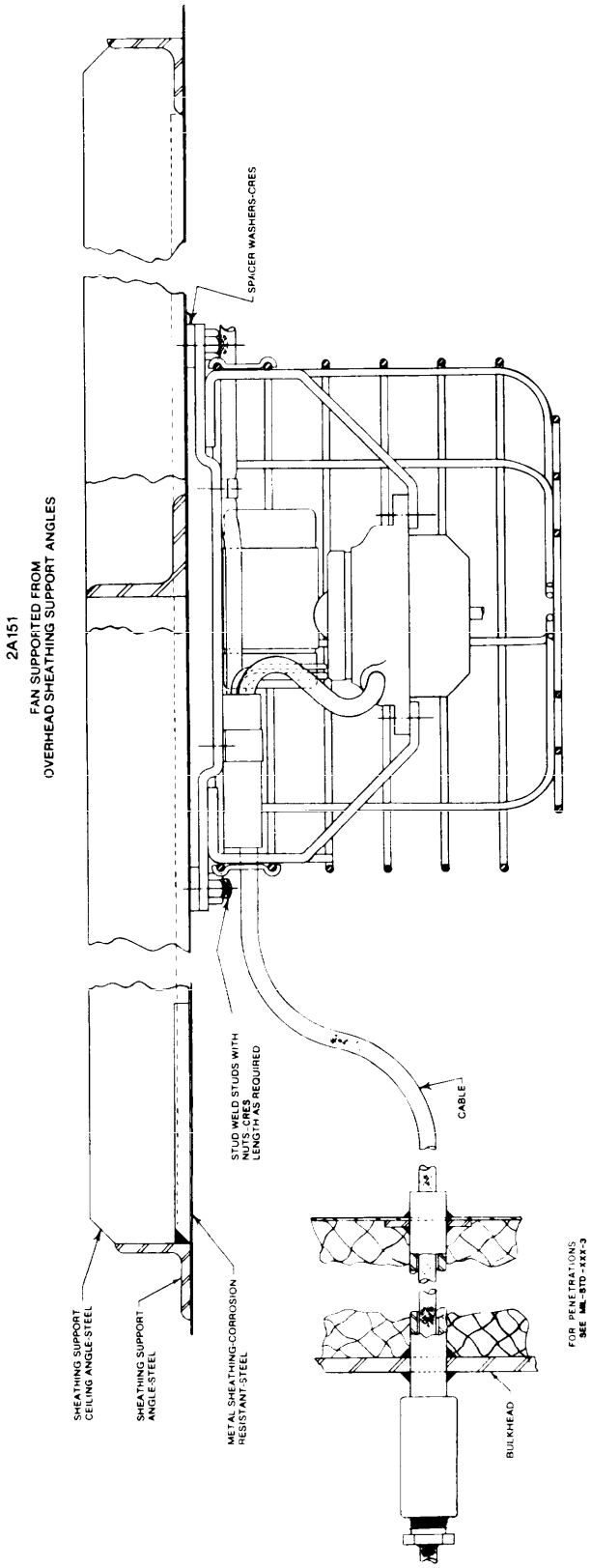
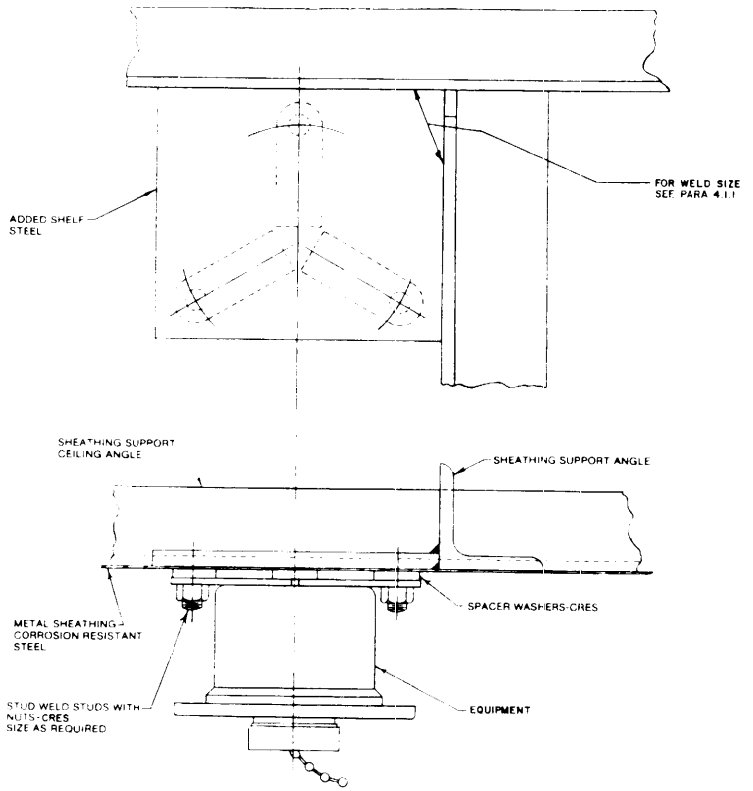


FIGURE 2A15. Ceiling fan support in refrigerated spaces.

SH 132317024

2A161

EQUIPMENT SECURED TO SHEATHING SUPPORTS



SH 132317025

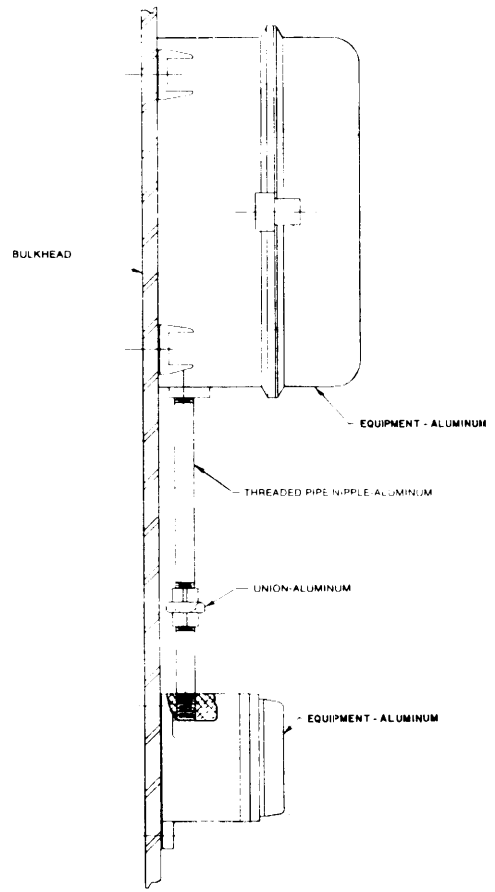
NOTES:

1. THIS FIGURE SUPERSEDES SHEET 2A16 OF DRAWING 803-5001027 AND SECTION 3, SHEET 16 OF DRAWING NAVSEC NO. 9000-S6202-73980

FIGURE 2A16. Equipment mounted in refrigerated spaces.

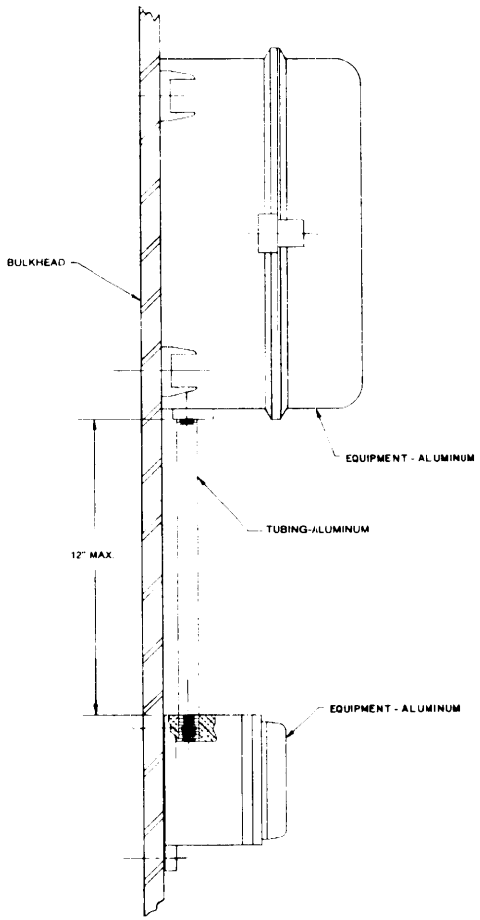
2A171

CAST EQUIPMENT
CONNECTIONS USING
THREADED PIPE NIPPLES



2A172

CAST EQUIPMENT
CONNECTIONS USING
ALUMINUM TUBING



SH 132317026

NOTES:

1. THIS FIGURE SUPERSEDES SHEET 2A17 OF DRAWING 803-5001027 AND SECTION 3, SHEET 31 OF DRAWING NAVSEC NO. 9000-S6202-73980.

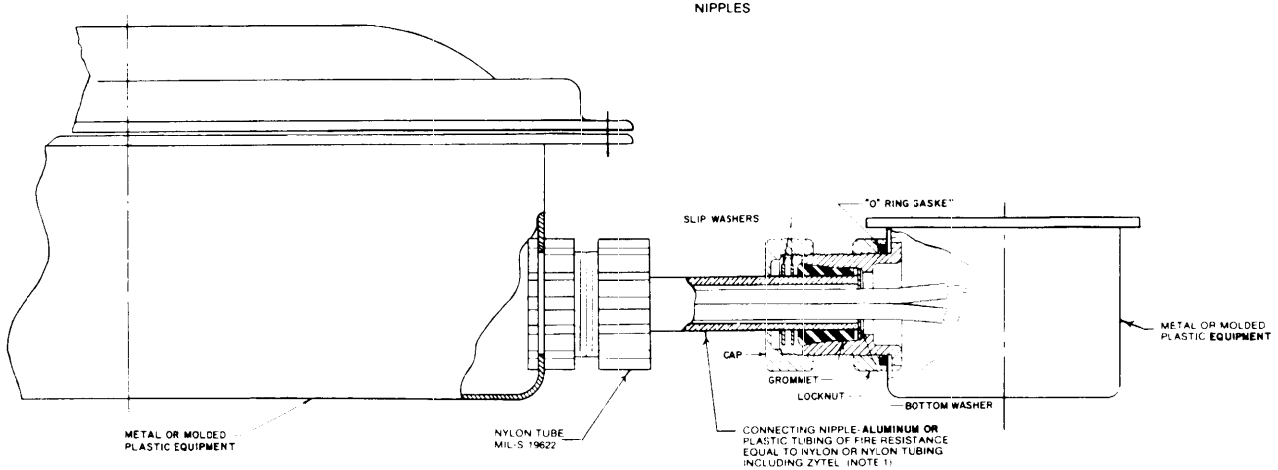
FIGURE 2A17. Connecting adjacent cast aluminum equipment with pipe nipples.

NOTE:

1. PLASTIC EQUIPMENT SHALL BE CONNECTED WITH PLASTIC TUBING ONLY.
2. THIS FIGURE SUPERSEDES SHEET 2A18 OF DRAWING 803-5001027 AND SECTION 3, SHEET 32 OF DRAWING NAVSEC NO. 9000-S6202-73980.

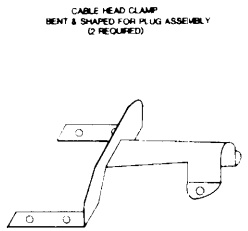
2A181

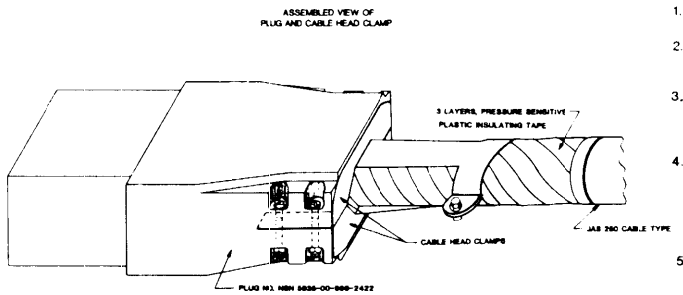
SHEET METAL EQUIPMENT
CONNECTED WITH PIPE OR TUBE
NIPPLES



SH 132317027

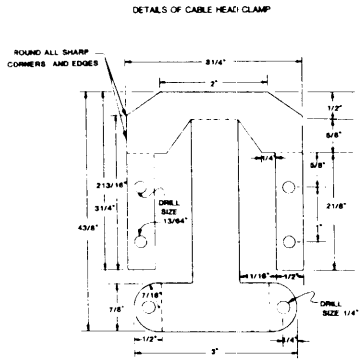
FIGURE 2A18. Connecting adjacent equipment with pipe nipples.

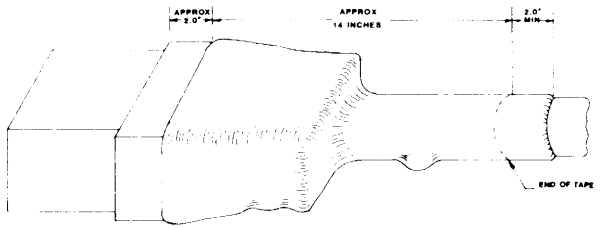




NOTES:

1. ROUND ALL CORNERS AND SMOOTH ALL EDGES ON THE CLAMP.
2. PRIOR TO INSTALLATION OF CLAMP, COVER 6" OF CABLE (STARTING INSIDE OF PLUG) WITH THREE LAYERS OF PRESSURE SENSITIVE PLASTIC INSULATING TAPE.
3. AFTER INSTALLATION OF CLAMP, COVER THE LENGTH OF CLAMP EXTENDING OVER THE CABLE WITH THREE LAYERS OF PRESSURE SENSITIVE PLASTIC INSULATING TAPE TO CONCEAL THE EXPOSED METAL.
4. SHRINK TUBING PC NO. 5 SHALL BE PER MIL-I-23053/15-106-0 CL 1 EXCEPT THAT IT SHALL BE EXPANDED TO 4.5 INCH DIAMETER AND COATED WITH AN ADHESIVE IN ACCORDANCE WITH THE REQUIREMENTS SHOWN ON FIGURE 1A5
5. THOROUGHLY SCRAPE AND ROUGHEN THE AREA CABLE AND PLUG TO BE COVERED TO INSURE THE ADHESION OF THE SHRINK TUBING. CLEAN THE ABRAIDED AREA WITH A LINT FREE CLOTH WETTED WITH ACETONE OR METHYL ETHYL KEYTONE AND ALLOW TO DRY.
6. POSITION SHRINK TUBING OVER PLUG AND CABLE ASSEMBLY AS SHOWN IN STEP II. APPLY HEAT TO SHRINK TUBING STARTING AT THE CABLE ADVANCE TOWARD THE PLUG END. WHEN THE SHRINK TUBING HAS RECOVERED ENOUGH TO ASSUME THE CONFIGURATION OF THE PARTS COVERED, DISCONTINUE HEATING.
7. THIS FIGURE SUPERSEDES SHEET 2A19 OF DRAWING 803-5001027





SH.13231797

FIGURE 2A19.400 hertz aircraft servicing cable head clamps.

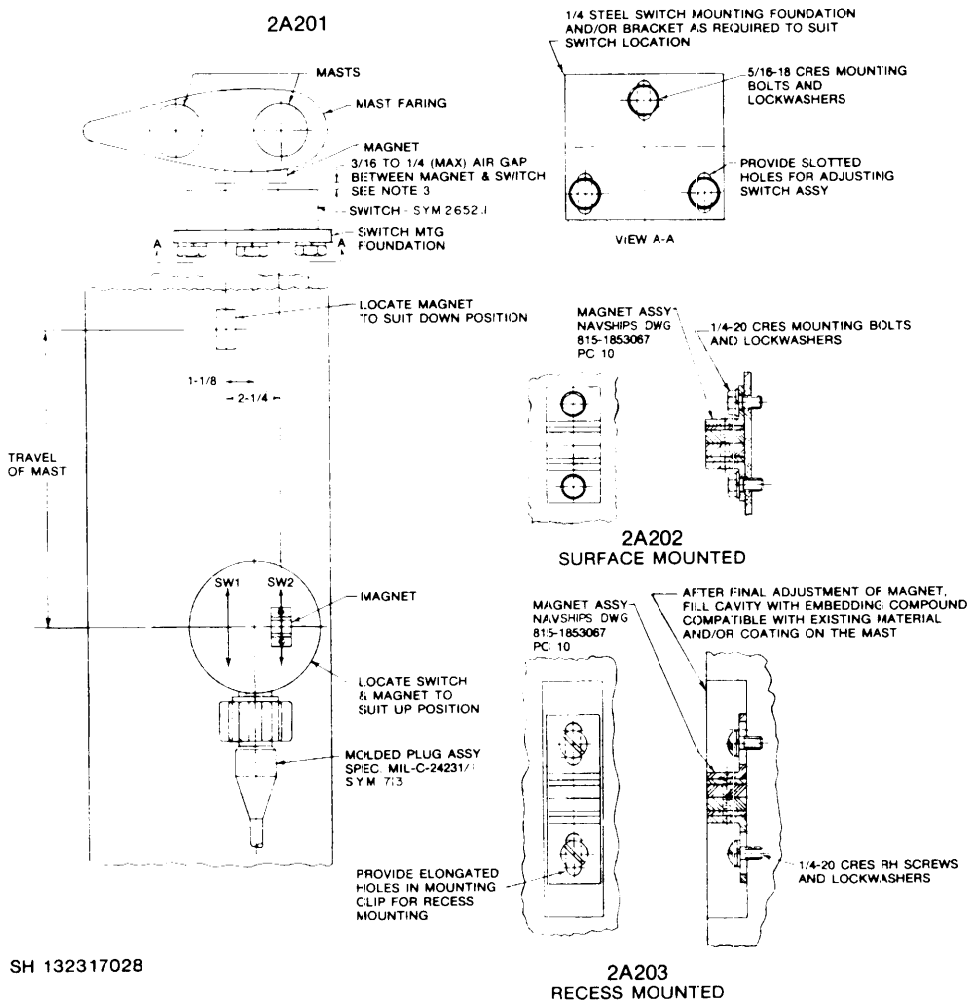


FIGURE 2A20. Mast position indicator switches for submarines.

NOTES:

1. TYPICAL METHODS SHOWN HERE ARE FOR INFORMATION AND GUIDANCE TO INSTALLING ACTIVITIES FOR MOUNTING INDICATOR SWITCHES AND ASSOCIATED MAGNETS
2. SWITCHES AND MAGNETS SHALL BE MOUNTED IN SUCH A MANNER AS TO FACILITATE THEIR ADJUSTMENT IN THE DIRECTION OF MAST TRAVEL.
3. IF MAGNETS OTHER THAN THOSE FURNISHED WITH SWITCH ASSEMBLY ARE REQUIRED. THE FOLLOWING PRECAUTIONS SHALL BE TAKEN.
   A. AIR GAP BETWEEN SWITCH AND MAGNET MUST BE SET TO INSURE THAT THE COERCIVE FORCE OF THE MAGNET IS SUFFICIENT TO OPERATE THE SWITCH AT AN AMBIENT OF -40° F
   B. THE COERCIVE FORCE MUST BE LIMITED TO OPERATE ONLY THE SWITCH FOR WHICH IT IS INTENDED.
4. ALL WELDING SHALL BE IN ACCORDANCE WITH APPROVED METHODS.
5. MAGNET ASSEMBLIES OTHER THAN THOSE FURNISHED WITH SWITCH SHALL HAVE A THIN COATING OF EPOXY RESIN COMPOUND ARCOSET 200 AS MANUFACTURED BY A RIEF CO. OF PHIL. PA OR EQUAL.
6. THIS FIGURE SUPERSEDES SHEET 2A20 OF DRAWING 803-5001027 AND SECTION 5, SHEET 112, OF DRAWING, NAVSEC NO. 9000-S6202-739809.

LOCKING DEVICES
2A212
B - ELECTRICAL INSTALLATIONS

1. IN GENEFAL, LOCKING DEVICES SHOULD BE EMPLOYED UNDER THE FOLLOWING CONDITIONS:
   A. FOR MOUNTING ROTATING EQUIPMENT AND/OR MOUNTING EQUIPMENT IN STEERING GEAR COMPARTMENTS.
   B. FOR SECURING ELECTRICAL EQUIPMENT IN THE BATTERY COMPARTMENT AND IN AND ABOUT THE PROPULSION CONTROLS.
   REFER TO NAVSHIPS TECH MANUAL CHAP. 300.
2. PARTS SUBJECT TO VIBRATION.
   A. NUTS USED ON MOVING PARTS OR SUBJECT TO VIBRATION DURING OPERATION SHALL BE SECURED BY STAR WASHERS, COTTER PINS OR OTHER APPROVED FORM OF LOCKING DEVICE.
   B. EQUIPMENT ATTACHED DIRECTLY TO HULL FOUNDATIONS AND WHICH IS SUJECT TO SEVERE SELF-GENERATED VIBRATION, SHALL BE ATTACHED WITH THROUGH BOLTS AND SELF-LOCKING NUTS OR CASTELLATED NUTS AND COTTER PINS OR WIRE.
3. INTERIOR PARTS OF MACHINERY.
   A. NUTS OR BOLTS USED ON INTERIOR PARTS OF MACHINERY MUST BE WIRED, COTTERED OR OTHERWISE LOCKED.
4. SWITCHBOARD AND CONTROL EQUIPMENT.
   A. USE LOCKING DEVICES SUCH AS CHECK-NUTS AND LOCK WASHERS TO KEEP MECHANICAL CONNECTIONS TIGHT.
   REFER TO NAVSHIPS TECH MANUAL CHAP. 300.
   B. EQUIPMENT MOUNTED IN THE BATTERY COMPARTMENT ABOVE THE LEVELS OF THE LOWEST CELL TOPS SHALL BE ATTACHED WITH THROUGH BOLTS AND SELF-LOCKING NUTS OR CASTELLATED NUTS WITH COTTER PINS OR WIRE.
5. ENCLOSURES (FITTING & FIXTURES)
   A. LOCKING DEVICES ARE NOT REQUIRED FOR MOUNTING NON-ROTATING ELECTRICAL EQUIPMENT UNLESS SUBJECT TO EXCESSIVE VIBRATION. (SEE 2.A ABOVE).
6. OPEN EQUIPMENT (EXPOSED WIRING) BUS BARS. SWITCHES, ETC.)
   A. NUTS, BOLTS, AND SCREWS USED FOR STRUCTURAL PURPOSES ABOVE EXPOSED ELECTRICAL EQUIPMENT SHALL BE SECURED WITH ACCEPTABLE LOCKING DEVICES WHERE HOLDING NUT, SCREW, BOLT OR COMPONENT PART COULD FALL INTO THE EQUIPMENT. REFER TO MIL-S-16036.

NOTES:
1. THIS PLAN IS FOR GUIDANCE ONLY AND DOES NOT TAKE PRECEDENCE OVER ANY SPECIFICATION MENTIONED HEREON.
2. REFERENCED DOCUMENTS CONTAINED HEREIN ARE THOSE IN EFFECT ON ISSUE DATE OF THIS DRAWING. AMENDMENTS AND/OR REVISIONS TO REFERENCED DOCUMENTS BEARING A LATER DATE THAN ISSUE DATE OF THIS DRAWING TAKE PRECEDENCE.
3. SELF-LOCKING NUTS OF THE ELASTIC STOP NUT TYPE, WITH NYLON (OR EQUIVALENT) INSERT LOCKING RINGS SHALL NOT BE USED AT TEMPERATURES IN EXCESS OF 250°F.
4. FOR #10 SCREWS AND BELOW, USE OF TOOTH LOCK WASHERS IN LIEU OF SPLIT TYPE LOCKWASHERS IS PREFERRED.
5. LOCKING DEVICES SHOULD NOT BE PROVIDED WHERE LUG TERMINALS ARE USED FOR CONDUCTORS BELOW 4000 CM UNLESS SPECIFIED BY THE INDIVIDUAL EQUIPMENT SPECIFICATION. REFER TO SPEC MIL-E-917.
6. THIS FIGURE SUPERSEDES SHEET 2A21 OF DRAWING 803-5001027 AND SECTION 5, SHEET 136, OF DRAWING. NAVSEC NO. 9000-S6202-73980.

SYMBOLS

* THIS INCLUDES THE WIRING OF CONNECTION BOXES, DISTRIBUTION BOXES, JUNCTION BOXES, ROTARY SNAP SWITCHES, PUSH BUTTON SWITCHES, RECEPTACLES, TERM CONN OF FRAC HP MOTORS, LTG FIXTURES, ETC.

** WHERE SPRING LOCK-WASHERS AND TOOTHLOCK WASHERS ARE USED ON ELEC. CONNECTIONS, THEY SHALL BE EMPLOYED IN CONNECTION WITH FLAT WASHERS FOR BOLTS AND SCREWS LARGER THAN 1/4 DIAMETER.

Δ TOOTH LOCK WASHERS SHALL BE USED UNDER THE BEARING SURFACE OF SCREW HEADS OR NUTS WHICH EVER (IF BOTH, PLACE UNDER NUT) COMES IN CONTACT WITH PLASTIC MATERIAL

† ELASTIC STOP NUTS ARE GENERALLY PROCURED FOR THIS APPLICATION

2A211
A - ELECTRICAL CONNECTIONS

1. MOTORS & GENERATORS
   A. USE LOCK NUTS, LOCK WASHERS, OR OTHER MEANS TO LOCK CONNECTIONS WHICH TEND TO BECOME LOOSE BECAUSE OF VIBRATION. (SEE METHOD (BIOI) REFER TO NAVSHIPS TECH MANUAL CHAP. 300.
2. CONTROL & INSTRUMENT CIRCUITS
   A. UNLESS OTHERWISE SPECIFIED IN THE INDIVIDUAL EQUIPMENT SPECIFICATION, LOCKING DEVICES SHALL BE PROVIDED ON THE FOLLOWING BASIS FOR ELECTRICAL CONNECTIONS IN ALL EQUIPMENT: ALL NUTS, BOLTS, STUDS AND SCREWS USED FOR ELECTRIC CONNECTIONS SHALL BE SECURED BY MEANS OF A LOCKING DEVICE IN ACCORDANCE WITH ACCEPTABLE LOCKING DEVICES SUCH AS NUT AND LOCKNUT, SELF LOCKING NUT, EXTERNAL TOOTH LOCK WASHERS, INTERNAL TOOTH LOCK WASHERS AND SPLIT RING LOCK WASHERS EXCEPT THAT A LOCKING DEVICE NEED NOT BE PROVIDED WHERE LUG TERMINALS ARE USED FOR CONDUCTORS BELOW 4000 CM.
   REFER TO SPEC. MIL-E-917
3. PROPULSION CONTROL CUBICLE (OTHER THAN BUS BAR JOINTS)
   A. LOCKING DEVICES SHALL BE PROVIDED ON THE FOLLOWING BASIS FOR ELECTRICAL ASSEMBLIES IN ALL SWITCHGEAR UNITS AND IN ALL EQUIPMENT UNLESS OTHERWISE SPECIFIED IN THE INDIVIDUAL EQUIPMENT SPECIFICATIONS. ALL NUTS, BOLTS, STUDS AND SCREWS USED FOR ELECTRICAL CONNECTIONS SHALL BE SECURED BY MEANS OF AN ACCEPTABLE LOCKING DEVICE EXCEPT THAT A LOCKING DEVICE NEED NOT BE PROVIDED WHERE SOLDERLESS TYPE CONNECTORS ARE USED FOR CONDUCTORS BELOW 4000 CM.
   REFER TO SPECS: MIL-E-917 AND MIL-S-16036.
4. BUS BAR JOINTS (MAIN & AUXILIARY POWER)
   A. IN SECURING BUS JOINTS, BOLTS SHALL BE FITTED WITH A SECURING NUT AND A LOCK NUT, OR MAY BE FITTED WITH NUTS OF SPECIAL DESIGN WHICH HAVE BEEN SPECIFICALLY APPROVED BY NAVSEA. FLAT WASHERS SHALL BE USED UNDER ALL BOLT HEADS AND NUTS ADJACENT TO THE CONDUCTOR.
   B. INTER-CELL CONNECTORS IN BATTERY COMPARTMENTS SHALL BE SECURED WITH STAINLESS STEEL BOLTS, FLAT WASHERS AND NUTS CONFORMING TO ASTM A276, TYPE 316. REFER TO DOD-B-24541.
5. I. C. & F. C. EQUIPMENT
   A. LOCKWASHERS SHALL BE EMPLOYED WITH BOLTS OR MACHINE SCREWS AND NUTS IN ALL CASES USED TO SECURE ELECTRICAL CONNECTIONS.
   REFER TO MIL-I-983 AND MIL-E-16400.
6. SWITCHBOARDS AND CONTROL EQUIPMENT
   A. USE LOCKING DEVICES, SUCH AS CHECK NUTS OR LOCK WASHERS, WHERE NECESSARY TO KEEP CONNECTIONS TIGHT.
   REFER TO NAVSHIPS TECH MANUAL CHAP. 300.

APPLICATION	OUTLINE NO.	LOCKING DEVICE REQUIRED (NUMBERS INDICATE ORDER OR PREFERENCE)				REMARKS
		SPRING LOCK WASHER	TOOTH LOCK WASHER	JAM OR CHECK NUT	†APPD SELF-LOCKING NUT	
MAIN MOT & GEN MOUNTING	B-1-A, B-3-A, B-6-A				1	
TERMINAL	A-1-A	3**		2	1	
AUX MOT & GEN MOUNTING	B-1-A, B-3-A, B-6-A				1	THIS INCLUDES ALL MG SETS AND ALL A.C. & D.C. MOTORS USED IN AUX POWER CKTS
TERMINAL	A-1-A	3**	2**	4	1	
DISTRIBUTION SWBDS MOUNTING	B-2-A, B-2-B, B-6-A				1	APP'D SELF-LOCKING NUT PREFERRED FOR BUS BAR JOINTS. TOOTH LOCK WASHERS PREFERRED FOR TERMINAL STUDS
MECH CONN	B-4-A				3	
ELEC.CONN	A-6-A	3.**	2.**.Δ	4	1	
A.C. SWBDS MOUNTING	B-2-A, B-2-B, B-6-A				1	APP'D SELF—LOCKING NUT PREFERRED FOR BUS BAR JOINTS. TOOTH LOCK WASHERS PREFERRED FOR TERMINAL STUDS
MECH CONN	B-4-A				3	
ELEC. CONN	A-6-A	3.**	2.**.Δ	4	1	
PROP CONT CUBICLE MOUNTING	B-1-B, B-6-A				1	
ELEC. CONN	A-1-A	3.*	2.**.Δ	4	1	
CONTROL PANEL MOUNTING	B-2-A, B-2-B, B-6-A				1	LOCKING DEVICES NOT GENERALLY USED FOR CONTROL PANEL MTG EXCEPT FOR CONDITION B-2-A & B-2-B. THIS INCLUDES SMALL MOTOR CONTROLLERS
WIRING	A-2-A	2.**	1.**Δ	4	3	
BUS BAR JOINTS	A-4-A			2	1	
I.C. & F.C. EQUIPMENT INSTALLATION	B-4-A, B-5-A			3	4	
WIRING	A-5-A	2.**	1.**.Δ	3	4	
GENERAL WIRING CONNECTIONS	B-2-A	2.**.*	1.**.*Δ	3	4	
BUS BAR JOINTS IN BATTERY TANKS	A-4-A			2	1	
BATTERY CELL CONNECTORS	A-4-B					NONE REQUIRED

SH 132317029

FIGURE 2A21. Locking devices on electrical connections and installations on submarines.

SUBMARINE BRIDGE AREA

2A221

NOTES:

1. THIS FIGURE SUPERSEDES SHEET 2A22 OF DRAWING 803-5001027 AND SECTION 5, SHEET 111 OF DRAWING NAVSEC NO. 9000-36202-73980.

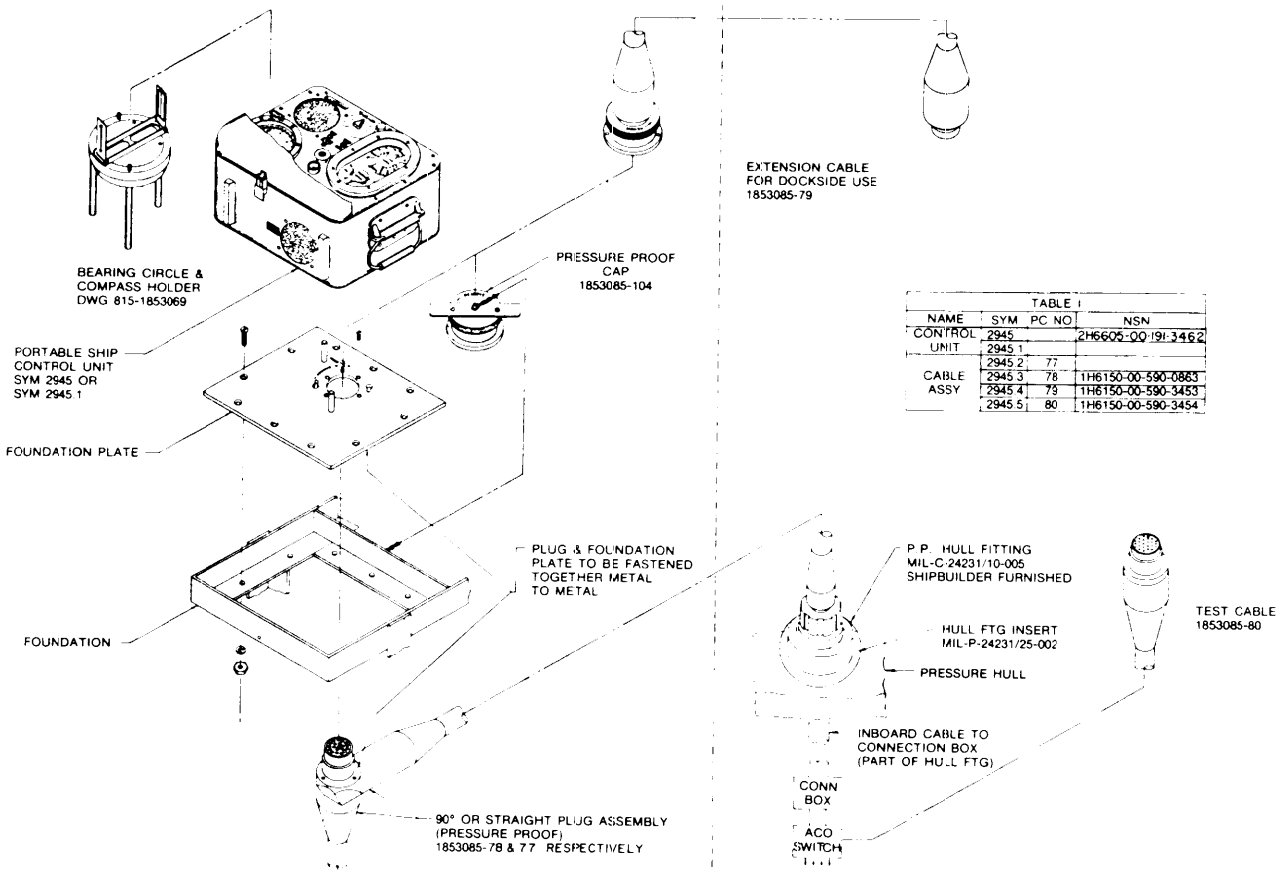


TABLE I

NAME	SYM	PC NO	NSN
CONTROL UNIT	2945		2H6605-00-191-3462
	2945.1		
	2945.2	77	
CABLE ASSY	2945.3	78	1H6150-00-590-0863
	2945.4	79	1H6150-00-590-3453
	2945.5	80	1H6150-00-590-3454

SH 132317030

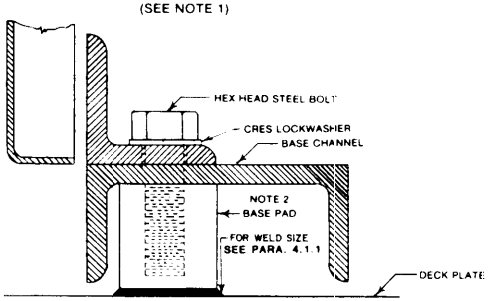
FIGURE 2A22. Portable ship control unit submarine bridge type.

NOTES:

1. BASE CHANNEL WEB STRENGTHING PIECES LOCATED ON EACH SIDE OF FOUNDATION BOLTS SHALL BE PROVIDED WHEN BASE PADS ARE NOT USED. WELD WEBS IN PLACE ON UNDERSIDE OF BASE CHANNEL TO FORM A SQUARE WITH FOUNDATION BOLT IN CENTER.
2. CRES WASHERS SHALL BE USED WHEN SWITCHBOARD FRAMING IS ALUMINUM AND BASE PAD IS STEEL.
3. THIS FIGURE SUPERSEDES SHEET 2B1 OF DRAWING 803-5001027 AND SECTION 3, SHEET 83 OF DRAWING, NAVSEC NO. 9000-S6202-73980.

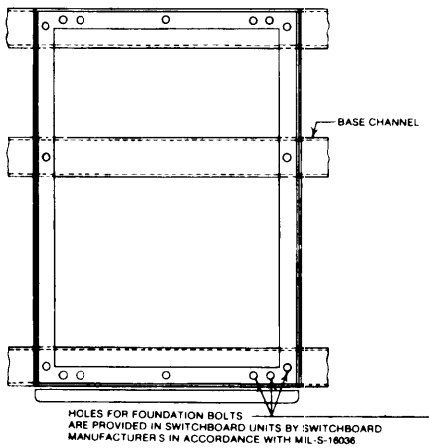
2B11

SECTION THROUGH BASE CHANNEL SHOWING BASE PAD (SEE NOTE 1)



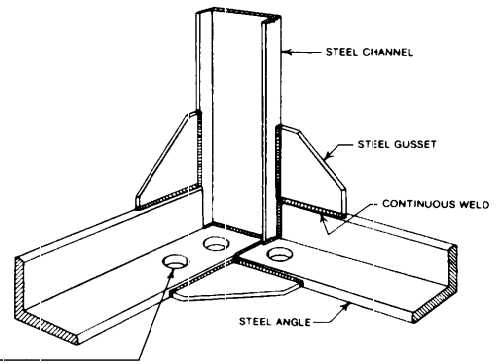
2B12

TYPICAL FLOOR PLAN FOR SWITCHBOARD UNIT



2B13

BOTTOM CORNER CONSTRUCTION



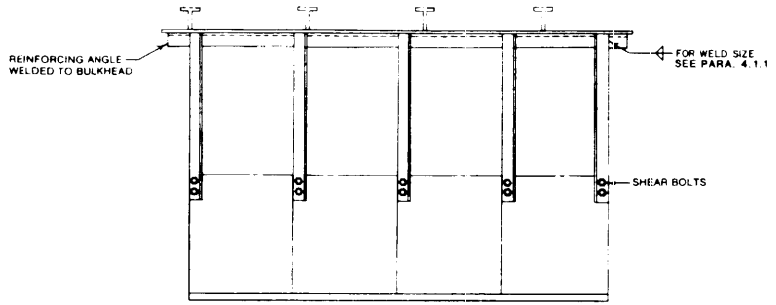
SH 132317031

FIGURE 2B1. Switchboard foundation bolting.

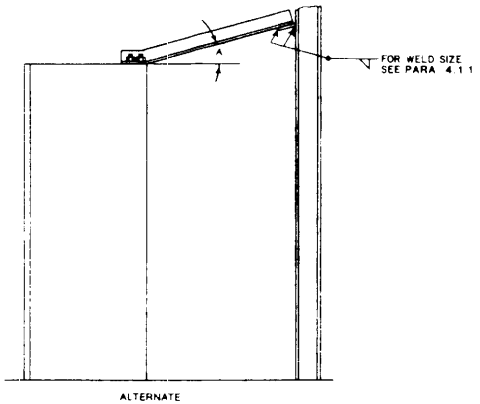
NOTES:

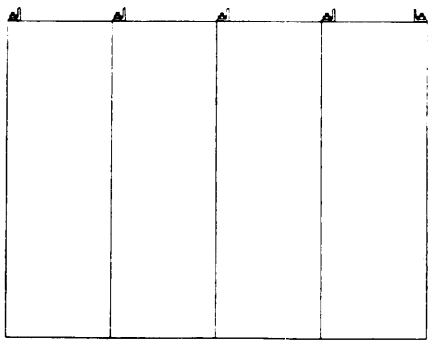
1. ANGLES MARKED "A" MUST BE LESS THAN 45°.
2. THIS FIGURE SUPERSEDES SHEET 2B2 OF DRAWING 803-5001027 AND SECTION 3, SHEET 79, OF DRAWING, NAVSEC NO. 9000-S6202-73980.

TYPICAL METHOD USING SHEAR BOLTS WITH TOP BRACING ATTACHED TO BULKHEAD

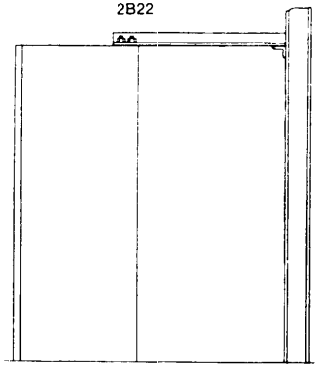


2B21





2B22



SH 132317032

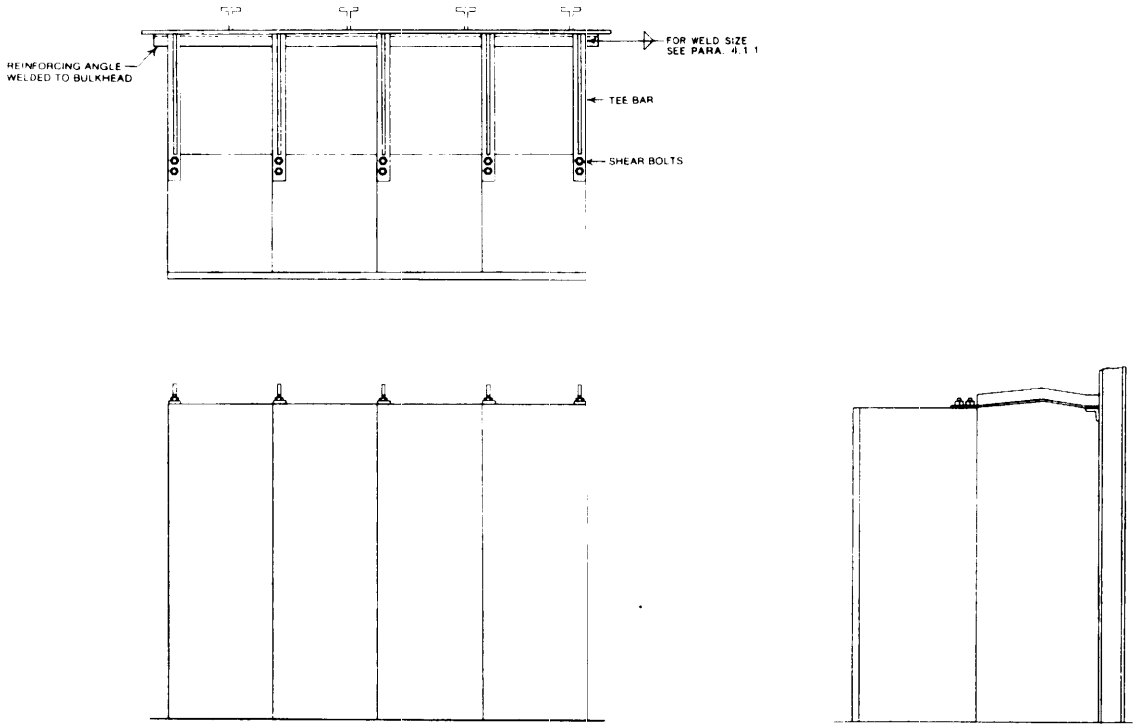
FIGURE 2B2. Switchboard bracing.

NOTES:

1. THIS FIGURE SUPERSEDES SHEET 2B3 OF DRAWING 803-5001027 AND SECTION 3, SHEET 79, OF DRAWING, NAVSEC NO. 9C00-S6202-73980.

2B31

TYPICAL METHOD USING INITIAL DEFLECTING BRACE



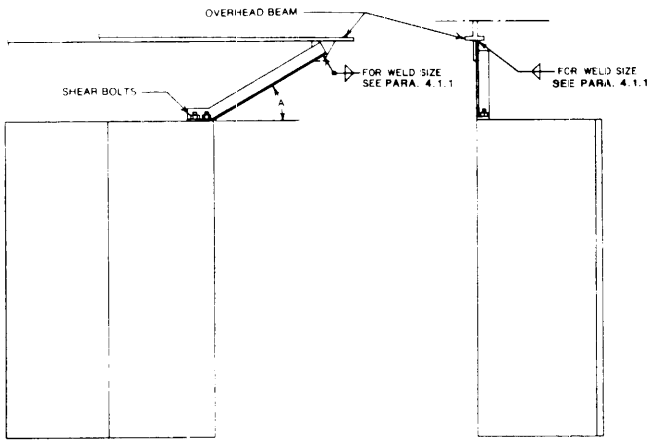
SH 132317033

FIGURE 2B3. Switchboard bracing.

NOTES:
1. WHERE THE LENGTH OF SWITCHBOARD SECTION IS LESS THAN THE HEIGHT, LENGTHWISE SPACING SHALL BE PROVIDED.
2. ANGLES MARKED "A" MUST BE LESS THAN 40°.
3. THIS FIGURE SUPERSEDES SHEET 2B4 OF DRAWING 5001027 AND SECTION 3 SHEET 81 & 82 OF DRAWING 803-NAVSEC 9000-S6202-73980.

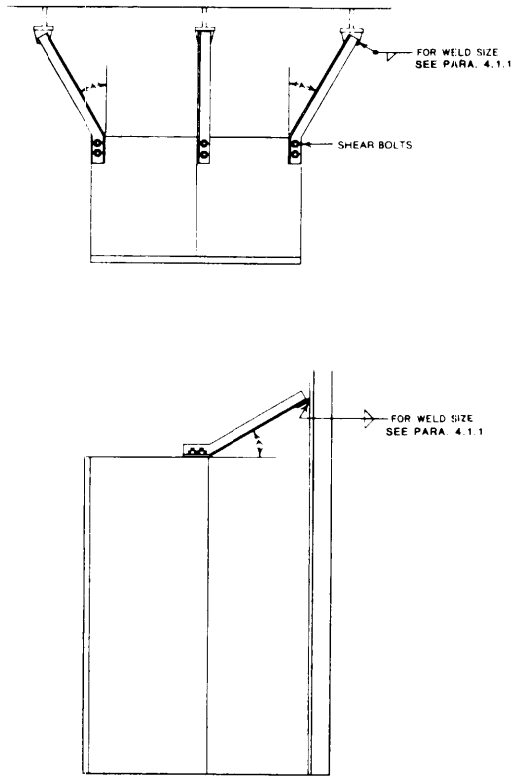
2B41

METHODS OF LENGTHWISE BRACING

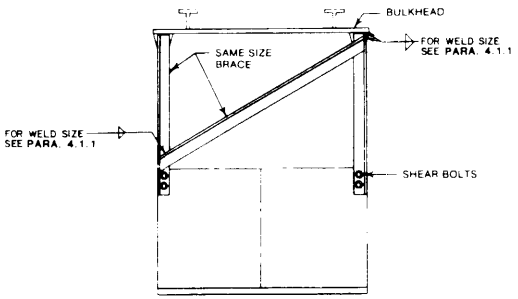


2B42

TYPICAL METHOD USING SHEAR BOLTS WITH TOP BRACING ATTACHED TO BULKHEAD STIFFENERS



2B43



SH 132317034

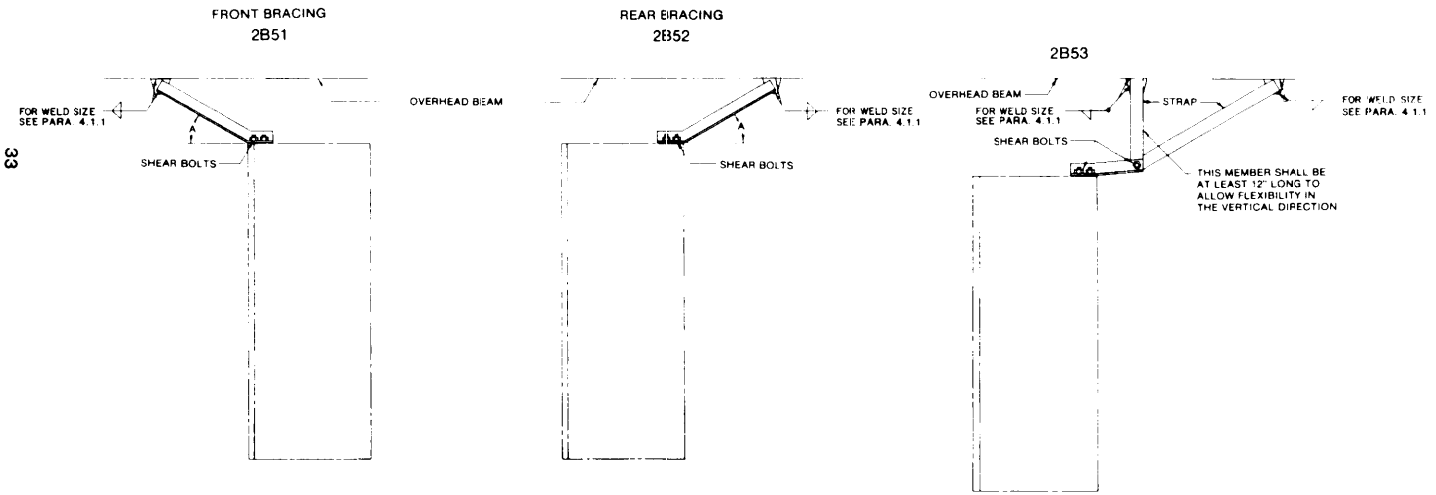
FIGURE 2B4. Switchboard bracing.

NOTES:

1. ANGLES MARKED "A" MUST BE LESS THAN 40°.
2. THIS FIGURE SUPERSEDES SHEET 2B5 OF DRAWING 803-5001027 AND SECTION 3, SHEET 78 & 84 OF DRAWING, NAVSEC NO. 9000-S6202-73980.

TYPICAL METHOD USING SHEAR BOLTS WITH TOP BRACING ATTACHED TO OVERHEAD BEAM

TYPICAL METHOD USING SHEAR BOLTS WHERE FLEXIBILITY IS PROVIDED IN BOTH HORIZONTAL & VERTICAL PLANE

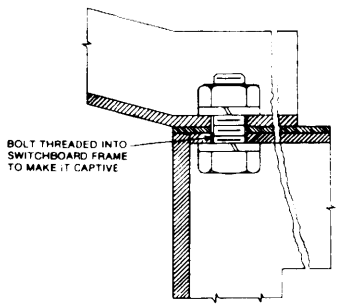


SH 132317035

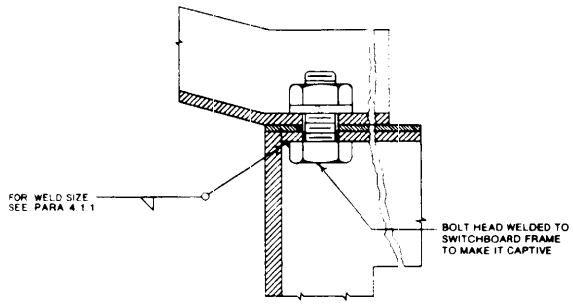
FIGURE 2B5. Switchboard bracing.

TYPICAL METHODS OF RETAINING SHEAR BOLTS.
NUTS & WASHERS

2B61

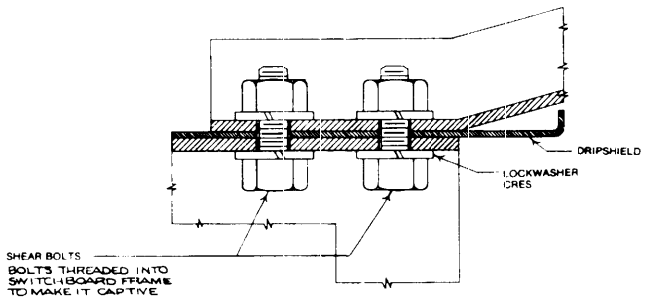


2B62



2B63

METHOD OF ATTACHING BRACE TO SWITCHBOARD
HAVING DRIPSHIELD

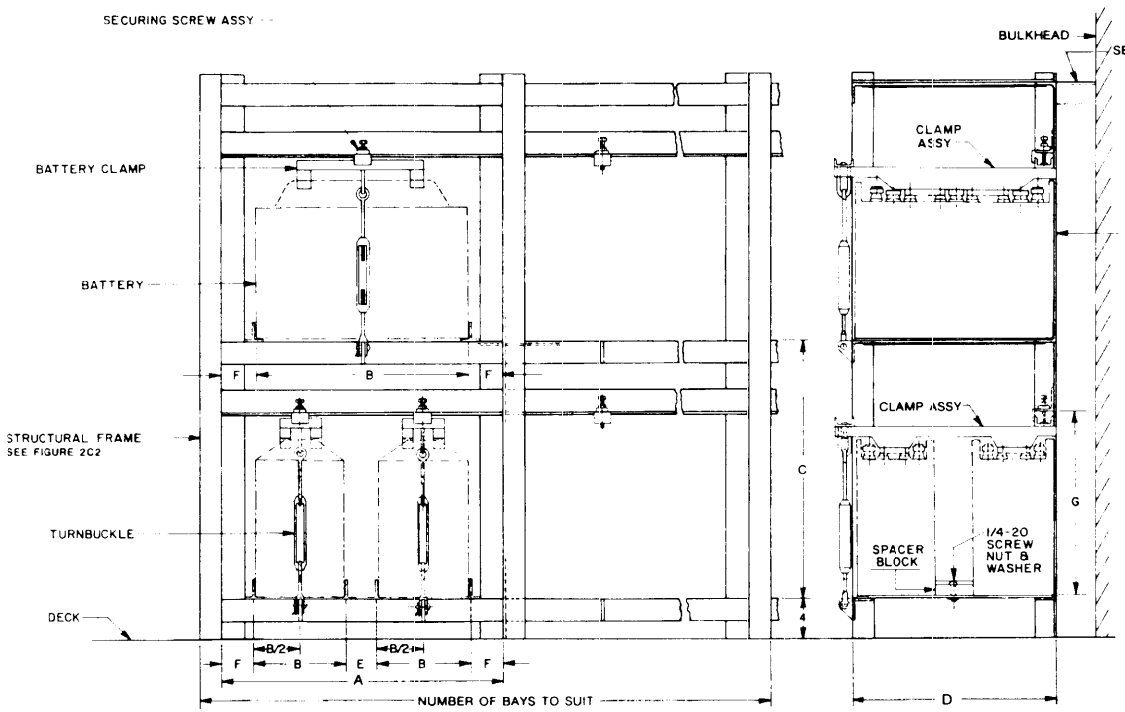


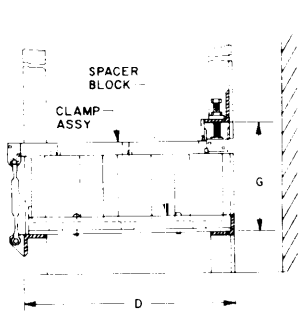
SH 132317036

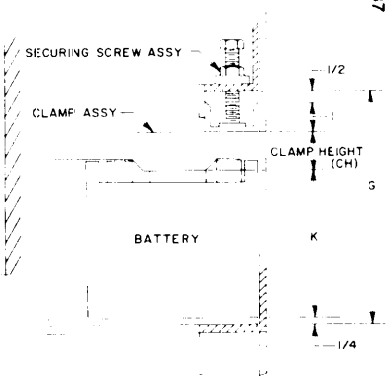
FIGURE 2B6. Switchboard bracing.

NOTES:

1. SHEAR BOLTS,NUTS & WASHERS IN SWITCHBOARD FRAMEWORKS SHALL BE MADE CAPITIVE
2. THIS FIGURE SUPERSEDES SHEET 2B6 OF DRAWING 803-5001027 AND SECTION 3, SHEET 111 & 112 OF DRAWING NAVSEC NO. 9000-S6202-73980.







NOTES:
1. HORIZONTAL MOUNTING SHALL BE SUCH AS TO PROVIDE EQUAL SPACE ON SIDES AND BETWEEN ADJACENT BATTERIES.
2. DIMENSIONS OF BATTERY RACKS ARE FOR BATTERIES SHOWN IN THIS TABLE. IF BATTERIES OTHER THAN THOSE SHOWN ARE USED, BATTERY RACK DIMENSIONS SHALL BE ADJUSTED ACCORDINGLY.
3. THIS FIGURE SUPERSEDES SHEET 2C1 OF DRAWING 803-5001027 AND SECTION 3, SHEET III & 112 OF DRAWING NAVSEC NO 9000-S6202-73980

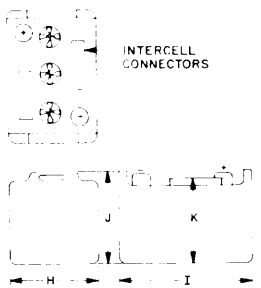


TABLE OF DIMENSIONS

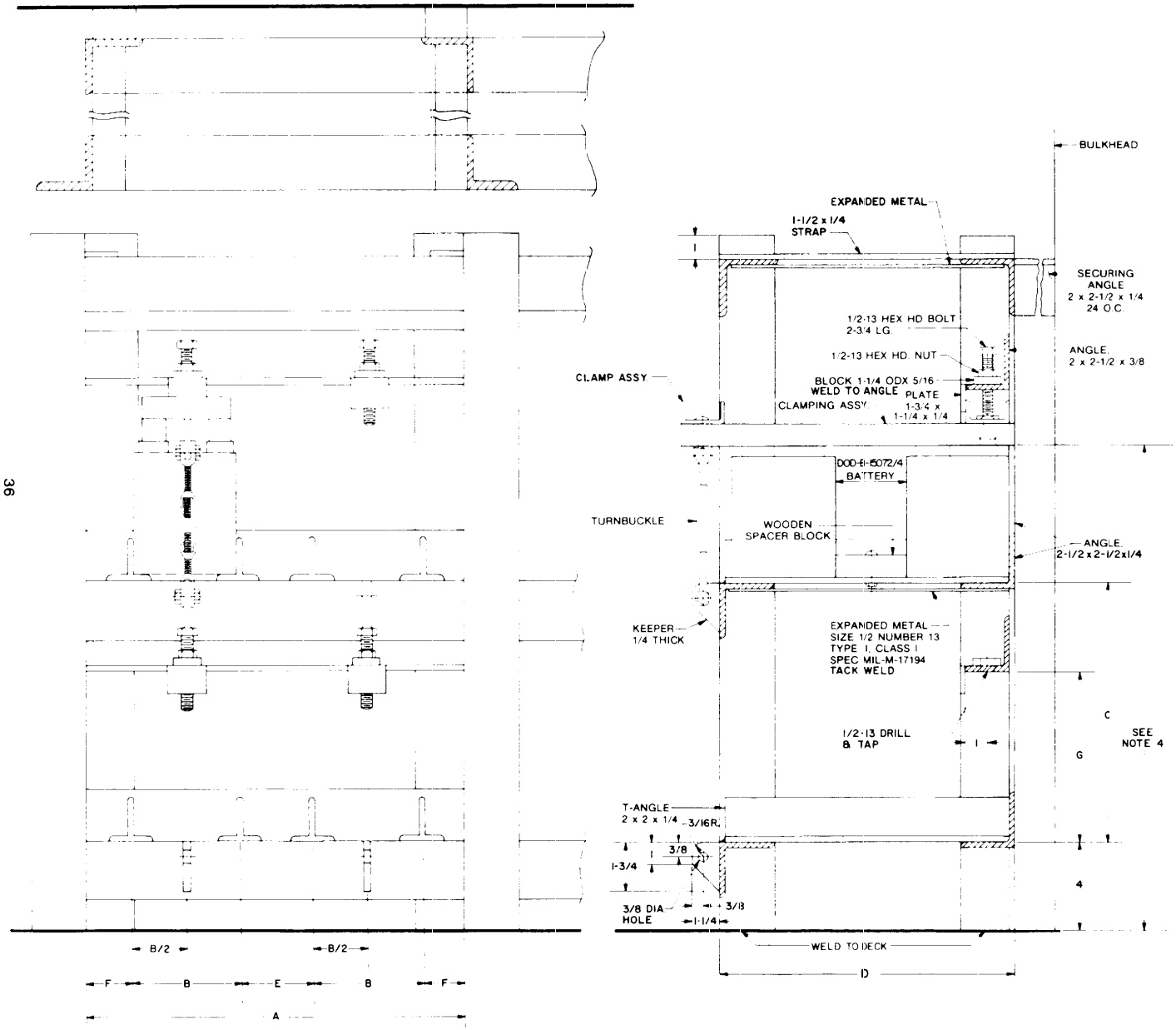
SYM NO.	BATTERY ASSIGNMENT SPECIFICATION	CLASS	A NO. OF BATTERIES 1	2	3	4	B	C	D NO. OF BATTERIES 1	2	3	SEE NOTE 1 E	F	SEE NOTE 2 G	H	I	J	K	CLAMP ASSY	TURN-BUCKLE	SPACER BLOCK
1490	DOD-B-15C72/3	2V-SBP-20AH	10	16-1/2	23	30-1/2	5-3/16	17-3/8			15-15/16			8-1/2	3-9/16	2-7/8	5-7/16	5-3/32	2C61	5/16	2C51
1491	/4	6V-SBM-15 AH	11-5/8	19-3/4	27-7/8		5-1/8	19-7/16		13-9/16				9-3/16	4-3/4	4-5/8	6-5/8	6-7/16	2C62		2C52
1492	/1	6V-SBM-50AH	14-1/8	24-3/4			7-5/8	22-7/8	9-15/16	22-5/8				12-13/16	7-1/8	9-3/8	9-11/16	9-1/4	2C73	3/8	1
1493	/5	6V-SBM-100AH	14-1/8	24-3/4			7-5/8	22-7/8	16-7/8					12-7/16	7-1/8	16-5/16	9-11/16	9-1/4	2C72	3/8	
1494	/6	6V-SBMD-130AH	14-1/8	24-3/4			7-5/8	23-3/8	16-7/8					12-15/16	7-1/8	16-5/16	10-3/16	9-3/4	2C72	3/8	
1495	/7	6V-SBM-200AH	13-13/16	24-1/8			7-5/16	28-9/16	20-11/16					19-5/16	6-13/16	20-1/8	15-15/16	14-13/16	2C81	3/8	
1496	/2	6V-SBMD-205AH	14-1/8	24-3/4			7-5/8	22-13/16	25-15/16					11-1/4	7-1/8	25-3/8	10-7/16	10	2C71	3/8	
1497	/8	6V-SBM-300AH	16-1/16	25-5/8			9-9/16	28-9/16	20-11/16					19-5/16	9-1/16	20-1/8	15-15/16	14-13/16	2C82	3/8	

1 USE CLAMP ASSEMBLY 2C83 AND SPACER BLOCK 2C53 FOR 50-AH BATTERIES IN TWO DEEP TRAY WITH "G" =10-15/16

J- TO TOP OF BATTERY HANDLES OR TERMINALS
K- TO TOP OF INTERCELL CONNECTORS OR TO TOP OF BATTERY CASE IF INTERNAL CONNECTORS ARE USED

SH 132317037

FIGURE 2C1. Open battery racks.



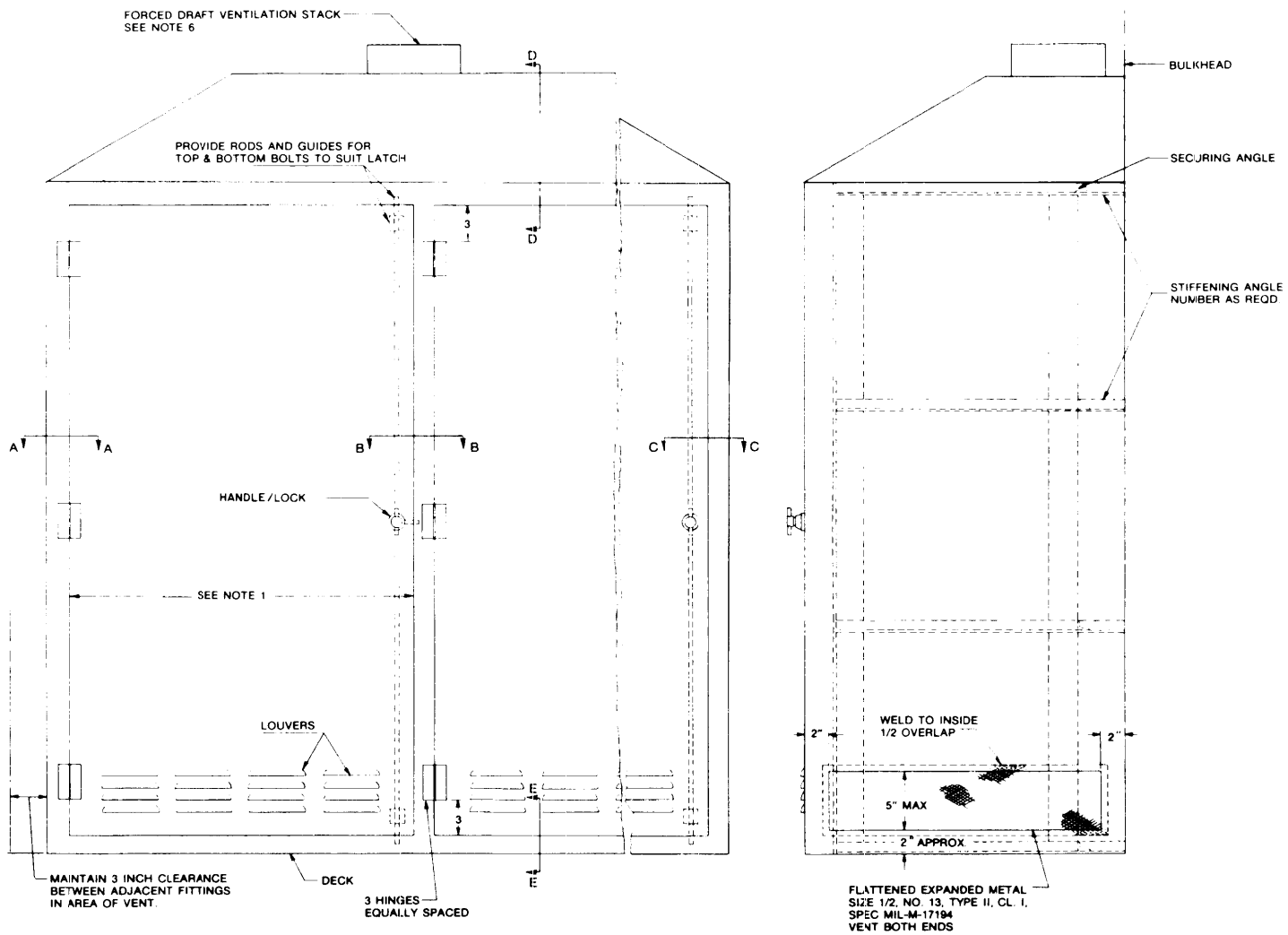
SH 132317038

FIGURE 2C2. Open battery rack details.

NOTES:

1. T ANGLE SHALL BE MEDIUM BLACK STEEL, SPEC. MIL-S-20166 GR. M, TYPE A.
2. L ANGLES SHALL BE MEDIUM BLACK STEEL SPEC. MIL-S-20166, GR M, TYPE A.
3. BATTERY RACKS SHALL BE COATED WITH AN EPOXY CONFORMING TO MIL-P-24441 AND APPLIED IN THE FOLLOWING MANNER
   - STEP 1- ALL SURFACES SHALL BE CLEANED OF GREASE,OIL,RUST AND OTHER CONTAMNIATES IN ACCORDANCE WITH NSTM CHAPTER 631
   - STEP 2- APPLY ONE COAT OF FORMULA 150 PRIMER OF MIL-P-24441 AT 2-4 MILS.
   - STEP 3- APPLY ONE COAT OF FORMULA 156 OF MIL-P-24441 AT 2-4 MILS.
   - STEP 4- APPLY FINAL COAT OF FORMULA 153 BLACK OF MIL-P-24441 AT 2-4 MILS.
4. MAXIMUM HEIGHT FROM DECK TO TOP OF BATTERY ON UPPERMOST SHELF SHALL NOT EXCEED 40 INCHES.
5. BATTERY ASSIGNMENT AND TABLE OF DIMENSIONS IS SHOWN ON FIGURE 2C1.
6. STRAPS AND ANGLES SHALL BE WELDED TOGETHER TO FORM A STURDY FRAME AS SHOWN FOR WELD SEE GENERAL NOTE 3.
7. TURNBUCKLES SHALL BE IN ACCORDANCE WITH SPEC FF-T-791, TYPE FORM 1, CLASS 7.
8. THIS FIGURE SUPERSEDES SHEET 2C2 OF DRAWING 803-5001027 AND SECTION 3, SHEET 113 OF DRAWING, NAVSEC NO. 9000-S6202-73980.

2C31



NOTES:
1. MAXIMUM WIDTH OF CABINET DOORS SHALL BE NOT MORE THAN 32 INCHES.
2. INTERIOR OF CLOSED CABINETS SHALL BE COATED WITH AN EPOXY CONFORMING TO MIL-P-24441 AND APPLIED PER NOTE 3 OF FIGURE 2C2.
3. EXTERIOR SHALL BE FINISHED IN ACCORDANCE WITH SPEC MIL-E-917.
4. ENCLOSURE IS DESIGNED TO ACCOMMODATE OPEN RACKS SHOWN ON FIGURE 2C1 AND 2C2.
5. MATERIAL SHALL BE STEEL IN ACCORDANCE WITH SPEC ASTM-A-366 CLASS 1, FIN MATTE.
6. VENTILATION EXHAUST SHALL BE DISCHARGED OVERBOARD OR INTO A NON-RECIRCULATING DUCT.
7. SECTION DETAILS ARE SHOWN ON FIGURE 2C4.
8. THIS FIGURE SUPERSEDES SHEET 2C3 OF DRAWING 803-5001027 AND SECTION 3, SHEET 114 OF DRAWING, NAVSEC NO. 9000-S6202-73980.

SH 132317039

FIGURE 2C3. Enclosed battery racks.

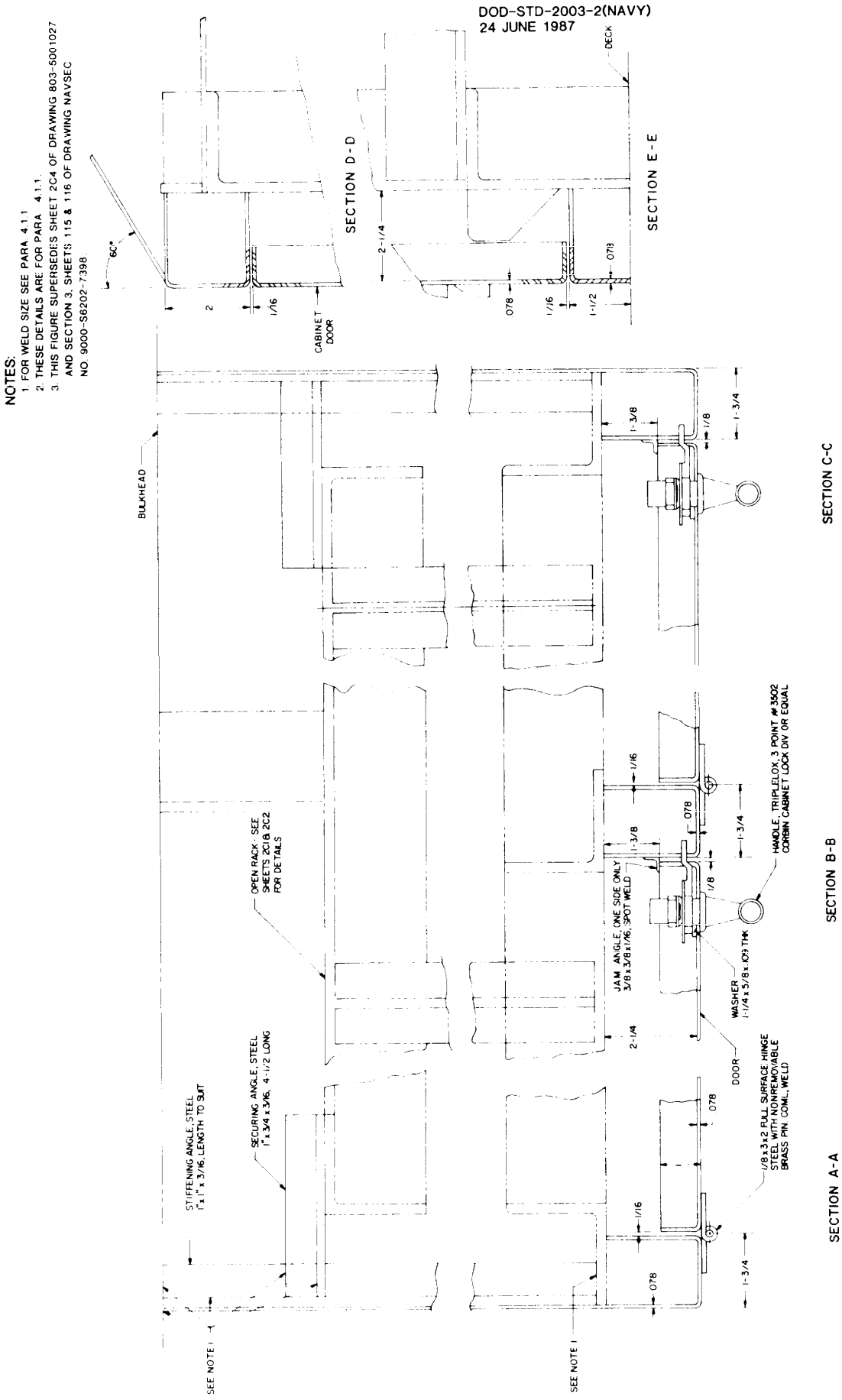


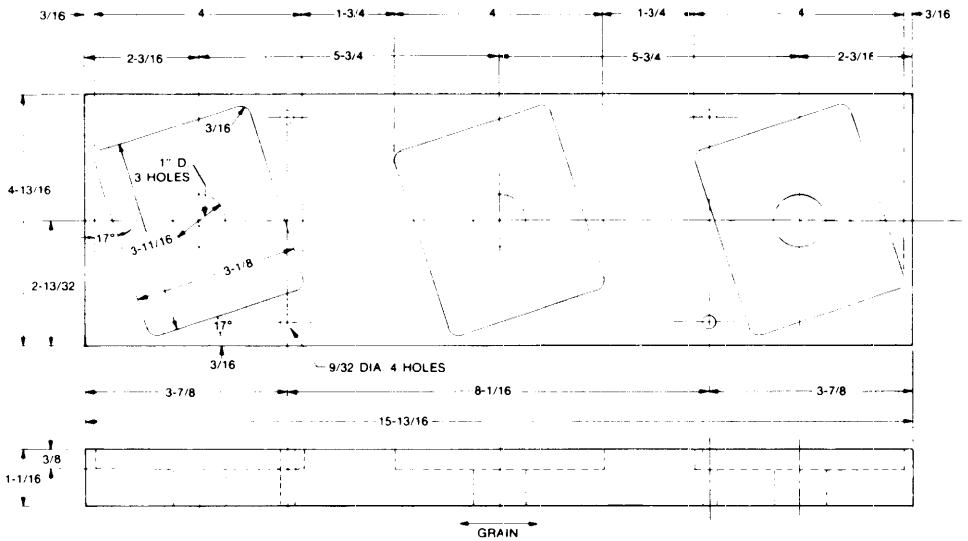
FIGURE 2C4. Enclosed battery rack details.

SH 132317040

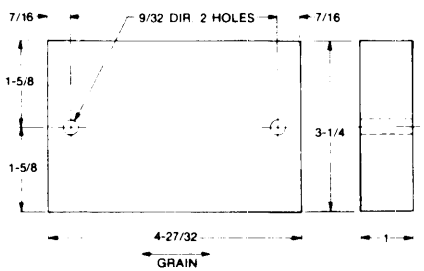
NOTES:

1. ALL COMPONENTS SHALL BE COATED WITH EPOXY BEFORE ASSEMBLY PER NOTE 3 OF FIGURE 2C2.
2. RETAINER BLOCKS TO BE CLEAN HARD MAPLE IN ACCORDANCE WITH FEDERAL SPEC MM-L-736.
3. THIS FIGURE SUPERSEDES SHEET 2C5 OF DRAWING 803-5001027 AND SECTION 1, SHEET 64 OF DRAWING NAVSEC NO. 9000-S6202-73980.

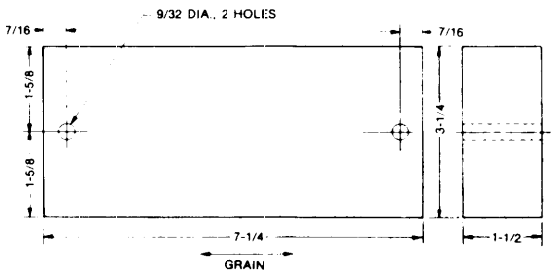
2C51



2C52

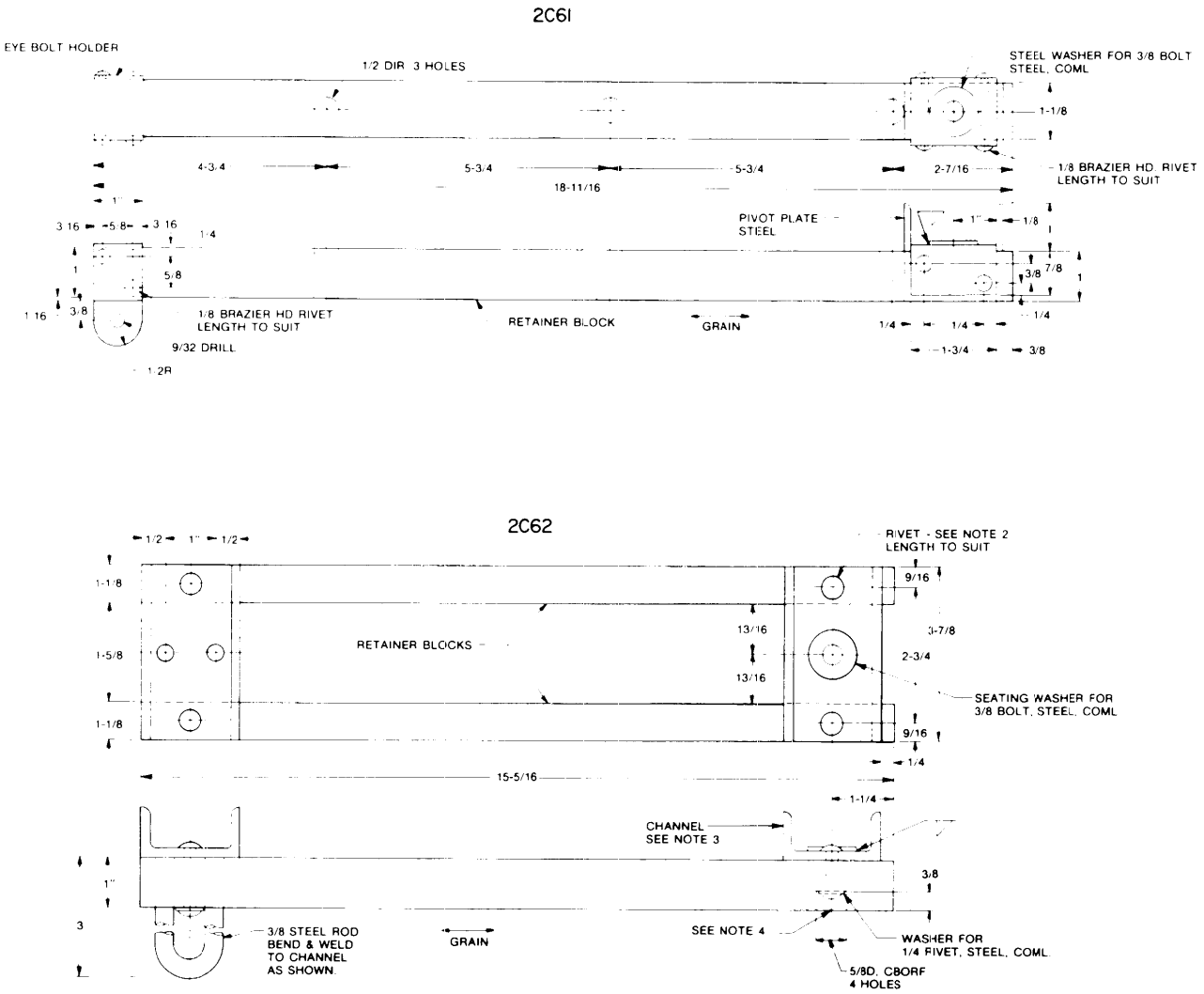


2C53



SH 132317041

FIGURE 2C5. Details of wood spacer blocks for battery racks.



SH 132317042

FIGURE 2C6. Battery clamp details.

NOTES:

1. ALL COMPONENTS SHALL BE COATED WITH EPOXY BEFORE ASSEMBLY PER NOTE 3 OF FIGURE 2C2.
2. RIVET SHALL BE 1/4 BRAZIER HEAD, HIGH TENSILE STEEL SPEC MIL-R-1223.
3. CHANNEL SHALL BE STEEL, SPEC QQ-S-741, TYPE 1, SIZE 2 x 1 x 3/16.
4. SEALERS AND COMPOUNDS SHALL COMPLY WITH GENERAL NOTE 5.
5. RETAINER BLOCKS TO BE CLEAN HARD MAPLE IN ACCORDANCE WITH PARA 4.1.4
6. THIS FIGURE SUPERSEDES SHEET 2C6 OF DRAWING 803-5001027 AND SECTION 1, SHEET 63 DRAWING NAVSEC NO. 9000-S6202-73980.

NOTES:

1. ALL COMPONENTS SHALL BE COATED WITH EPOXY BEFORE ASSEMBLY PER NOTE 3 OF FIGURE 2C2
2. RIVET SHALL BE 1/4 BRAZIER HEAD, HIGH TENSILE STEEL SPEC MIL-R-1223
3. CHANNEL SHALL BE STEEL, SPEC-QQ-741, TYPE 1, SIZE 2 x 1 x 3/16.
4. RETAINER BLOCKS TO BE CLEAR HARD MAPLE IN ACCORDANCE WITH FEDERAL SPEC MM-L-739.
5. FOR WELD SIZE SEE PARA 4.1.1.
6. THIS FIGURE SUPERSEDES SHEET 2CC7 OF DRAWING 803-5001027 AND SECTION 1, SHEET 61 OF DRAWING NO. 9000-56202-73980

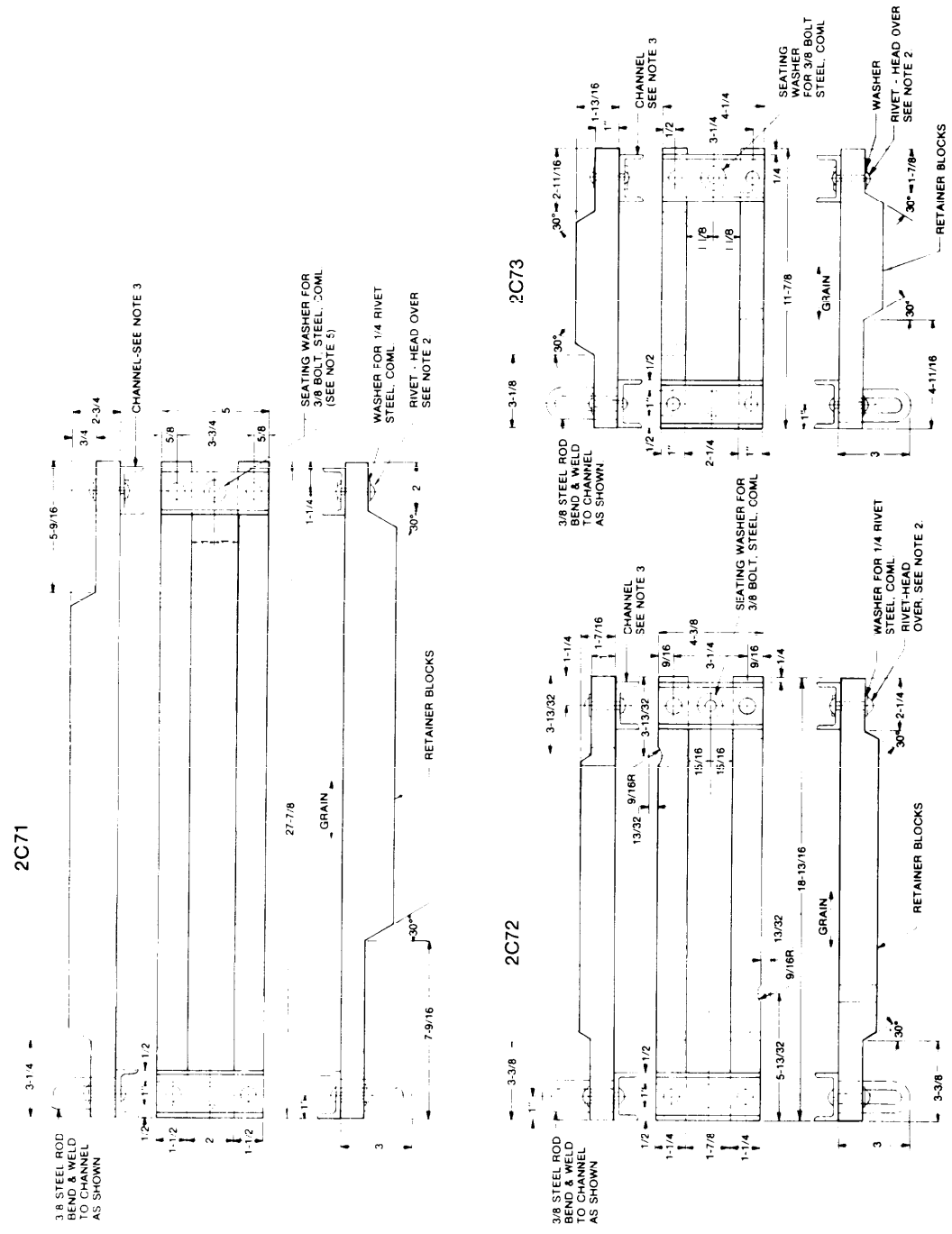


FIGURE 2C7. Battery clamp details.

SH 132317043

NOTES:

1. ALL COMPONENTS SHALL BE COATED WITH EPOXY BEFORE ASSEMBLY PER NOTE 3 OF 2C2.
2. RIVET SHALL BE 1/4 BRAZIER HEAD, HIGH TENSILE STEEL, SPEC MIL-R-1223.
3. CHANNEL SHALL BE STEEL SPEC QQ-S-741, TYPE 1, SIZE 2 x 1 x 3/16.
4. RETAINER BLOCKS TO BE CLEAR HARD MAPLE IN ACCORDANCE WITH FEDERAL SPEC MM-L-736.
6. FOR WELD SIZE SEE GENERAL NOTE 3.
7. THIS FIGURE SUPERSEDES SHEET 2C8 OF DRAWING 803-5001027 AND SECTION 1, SHEET 62 OF DRAWING, NAVSEC NO. 9000-S6202-73980.

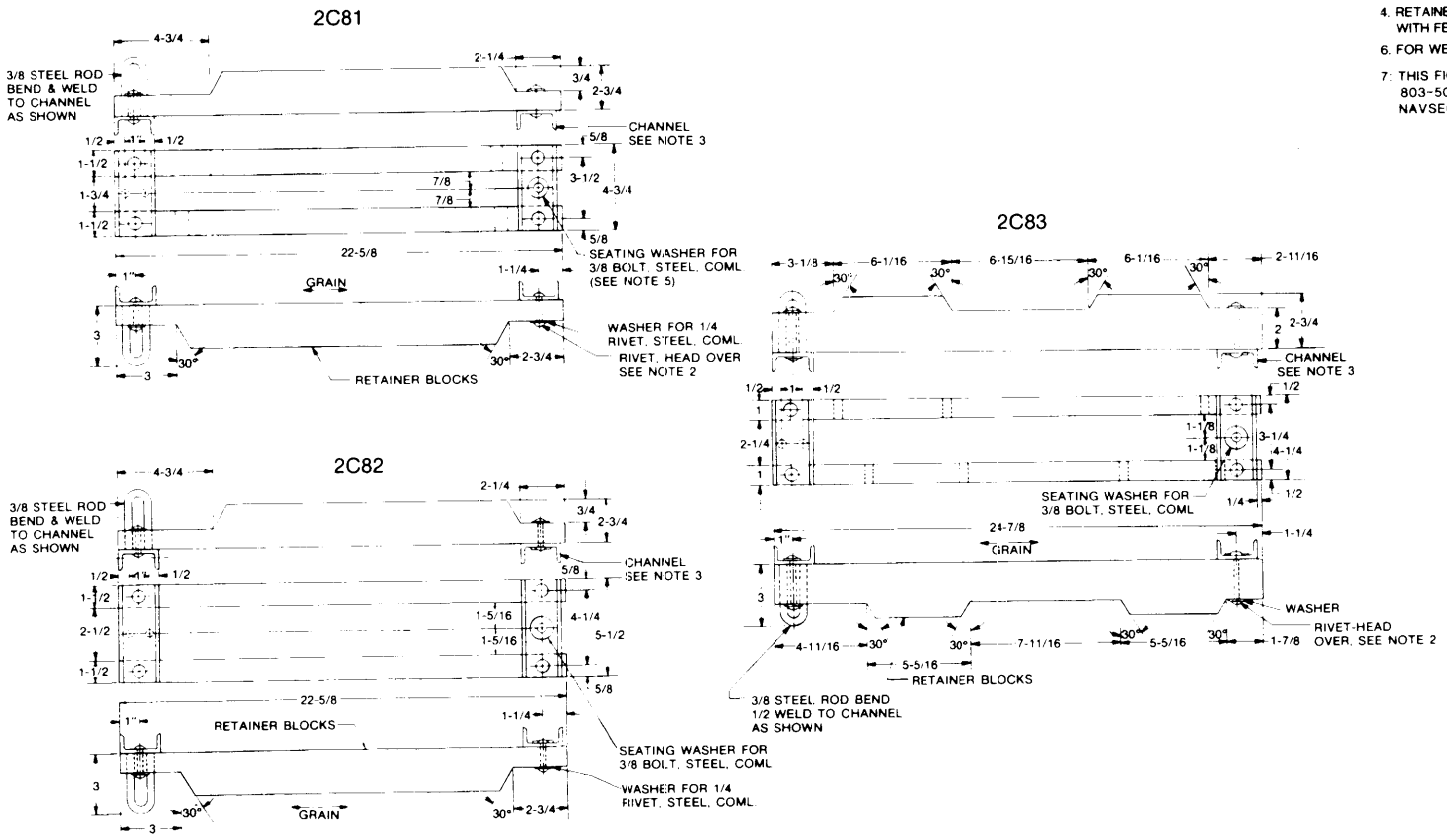
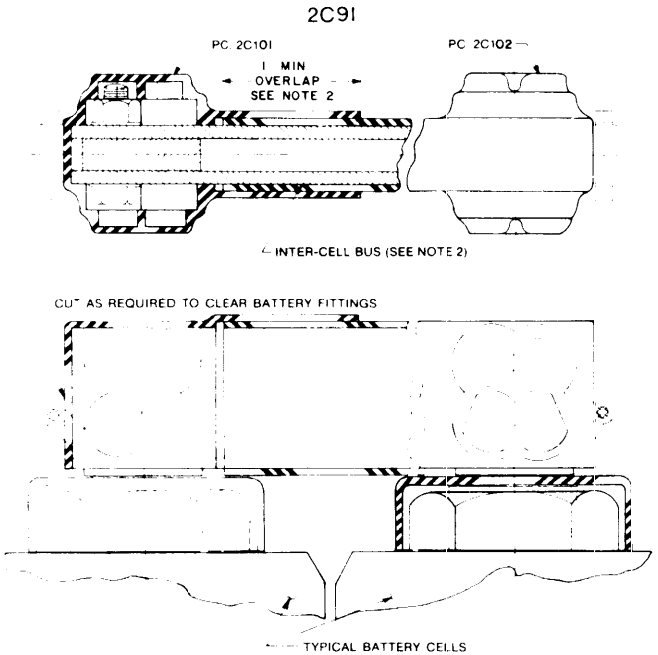
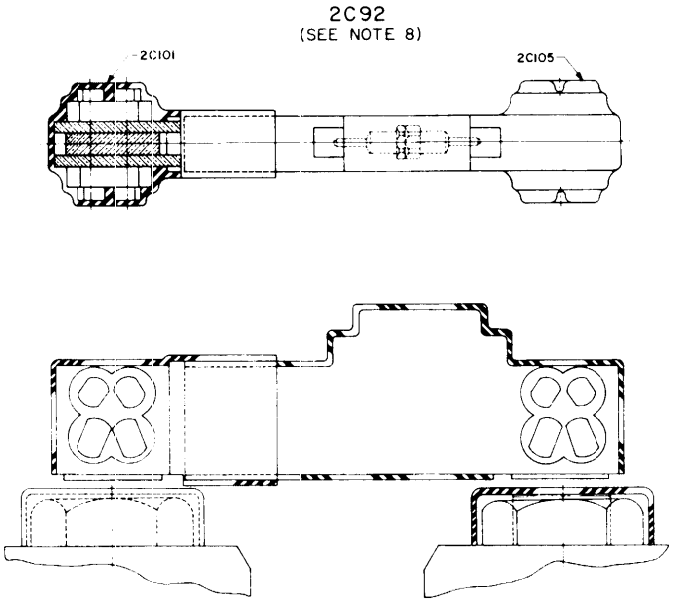
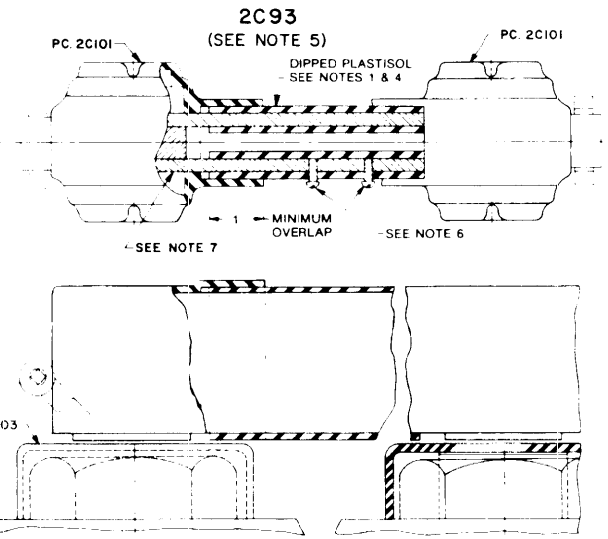


FIGURE 2C8. Battery clamp details.

SH 132317044





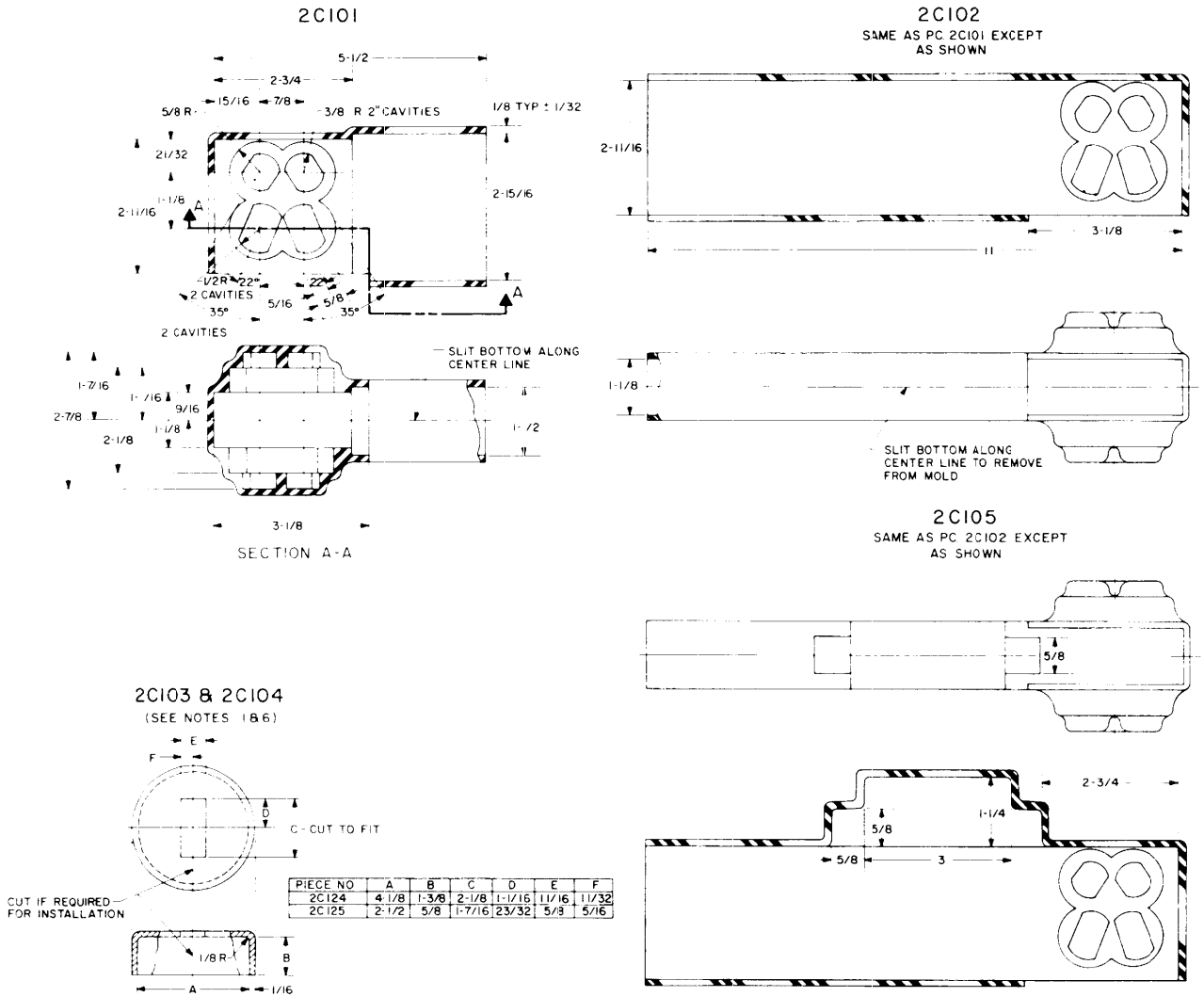


NOTES:

1. THE MATERIAL AND REQUIREMENTS FOR MOLDING INSULATING SLIP-ON CAPS, PCS 2C101 THRU 2C104 OR DIPPING INTERCELL BUS BAR CONNECTORS, SHALL BE PLASTISOL, TYPE P IN ACCORDANCE WITH MILITARY SPECIFICATION MIL- -15265 DETAILS FOR PCS 2C101 THRU 2C104 ARE SHOWN **ON FIGURE 2C10**
2. PCS 2C101, 2C102 AND 2C104 ARE DESIGNED FOR COVERING INTERCELL BUS BARS UP TO 15-1/2 INCHES LONG AND 2-1/2 INCHES WIDE
   (A) FOR SHORTER BUS BARS CUT PCS 2C102 & 2C104 AS REQ'D
   (B) FOR NARROW BUS BARS CUT BOTTOM OF PCS 2C101, 2C102 AND 2C104 TO SUIT
4. FOR APPLICATION INSTRUCTIONS FOR PLASTISOL SEE APPENDIX 10 OF MIL-I-15265B OR LATER ONLY TYPE P PLASTISOL SHALL BE USED
5. METHOD 2C93 SHOWN HEREON IS INTENDED AS AN ALTERNATE TO METHOD 2C91 AND FOR CROSS-OVER INTERCELL CONNECTORS
6. MOUNTING SCREWS FOR INDIVIDUAL CELL VOLTMETER FUSE BOXES SHALL BE INSTALLED IN THE TAPPED HOLES OF THE INTERCELL BUS BAR CONNECTORS PRIOR TO DIPPING IN PLASTISOL. THIS WILL KEEP HOLES FREE OF PLASTISOL AND WILL PROVIDE CLEARANCE HOLES IN THE PLASTISOL FOR THE SCREWS. MOUNTING SCREWS FOR INDIVIDUAL CELL VOLTMETER FUSE BUSES ARE NOT USED WHEN PC 2C104 IS USED. TAPE HOLES IN INTERCELL BUS BAR CONNECTORS PRIOR TO DRIPPING IN PLASTISOL TO AVOID ADHERENCE OF PLASTISOL
7. ENDS OF INTERCELL BUS BAR CONNECTORS SHALL BE WRAPPED WITH CARDBOARD AND TAPED, 2 TO 2-1/16 INCHES FROM EACH END, TO PREVENT ADHERENCE OF PLASTISOL
8. METHOD 2C92 SHALL BE USED WITH IN-LINE ICV FUSES
9. **THIS FIGURE SUPERSEDES SHEET 2C9 OF DRAWING 803-5001027 AND SECTION 5, SHEET 141, OF DRAWING, NAVSEC NO. 9000-S8202-73980.**

SH 132317045

FIGURE 2C9. Insulation of battery bus terminals submarines.



PIECE NO	A	B	C	D	E	F
2C124	4-1/8	1-3/8	2-1/8	1-1/16	11/16	11/32
2C125	2-1/2	5/8	1-7/16	23/32	5/8	5/16

NOTES:

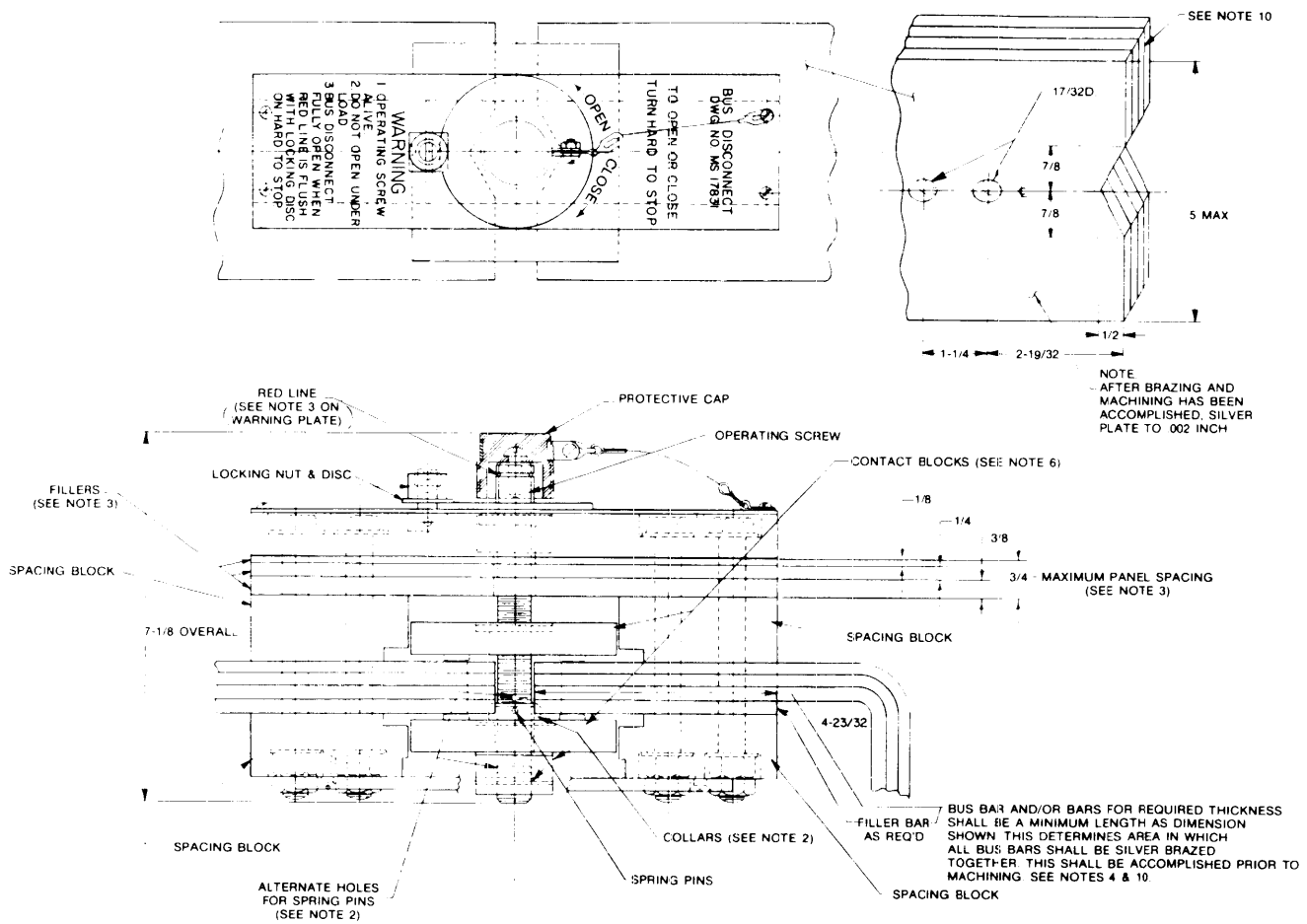
1. THE MATERIAL AND REQUIREMENTS FOR MOLDING INSULATING CAPS SHALL BE PLASTISOL, TYPE P, IN ACCORDANCE WITH MILITARY SPECIFICATION MIL - 1 - 15265B OR LATER
2. THIS FIGURE SUPERSEDES SHEET 2C10 OF DRAWING 803-5001027 AND SECTION 5, SHEET 152 OF DRAWING NAVSEC NO. 9000-S6202-73980.

SH 132317046

FIGURE 2C10. Battery bus terminal insulators submarines.

BUS DISCONNECT
MIL STD. DWG. MS 17831
(SHIPS)
2C111

METHOD OF PREPARING
BUS BAR ENDS
2C112

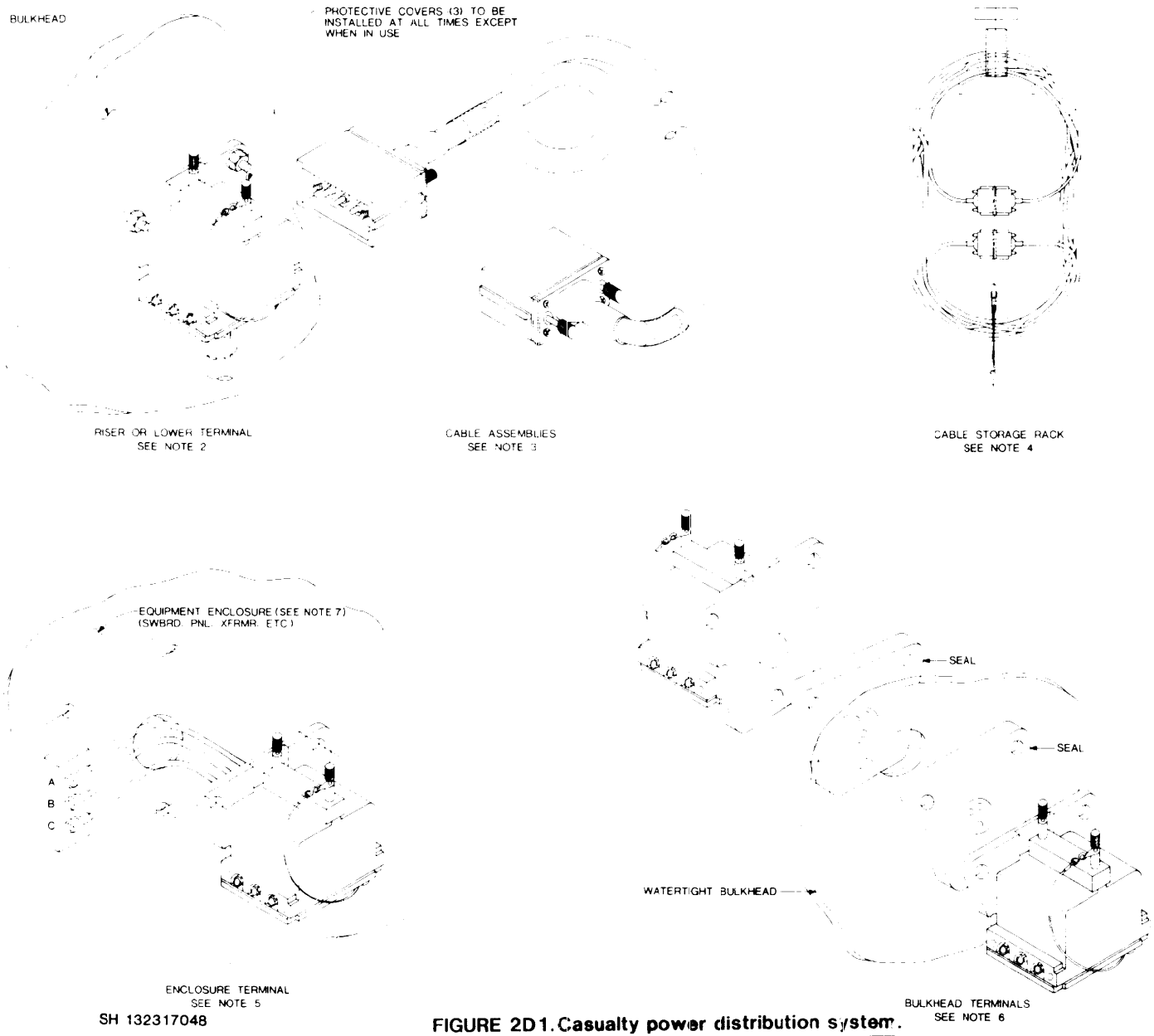


SH 132317047

NOTES:

1. BUS DISCONNECT SHOWN HEREON IS DESIGNED FOR A MAXIMUM OF 7000 AMPS.
2. WHEN (4) THICKNESSES OF BUS BAR ARE USED, COLLAR LOCATIONS ARE AS SHOWN. WHEN (3) THICKNESSES OF BUS BAR ARE USED, BOTH COLLARS SHALL BE RE-LOCATED ON OPERATING SCREW AND RE-PINNED IN ALTERNATE HOLES INDICATED.
3. ALL FILLERS ARE RETAINED WHEN BUS DISCONNECT IS NOT PANEL MOUNTED. FOR PANEL MOUNTING THE FOLLOWING SHALL APPLY.
   (A) FOR 3/8 PANEL, OMIT 1/8 & 1/4 FILLERS.
   (B) FOR 1/2 PANEL, OMIT 1/8 & 3/8 FILLERS.
   (C) FOR 5/8 PANEL, OMIT 3/8 & 1/4 FILERS.
   (D) FOR 3/4 PANEL, OMIT ALL FILLERS.
4. BUS BAR ON EACH SIDE OF DISCONNECT SHALL BE THE SAME THICKNESS TO WITHIN .001 OF AN INCH.
5. AT INSTALLATION THE FOLLOWING PRECAUTIONS SHALL BE TAKEN.
   (A) PROTECT CONTACT SURFACES FROM DAMAGE.
   (B) AVOID UNNECESSARY STRESS OR STRAIN WHEN ALIGNING ASSEMBLY.
6. INSPECTION SHALL FOLLOW INSTALLATION TO DETERMINE SATISFACTORY BUS BAR ALIGNMENT AND TO ASSURE CONTACT SURFACES HAVE A MINIMUM OF 90% LINE CONTACT. THIS MAY BE VERIFIED BY OBTAINING AN IMPRESSION BY USE OF CARBON AND WHITE PAPER TIGHTENED BETWEEN CONTACTS.
7. BUS DISCONNECT SHALL BE OPERATED WITH INSULATED WRENCH SHOWN ON MILITARY STANDARD, MS 17832.
8. BUS DISCONNECT IS NOT INTENDED TO INTERRUPT CURRENT.
9. BUS DISCONNECT IS INSULATED FOR 1000 VOLTS BETWEEN TERMINALS & PANEL WHEN FULLY OPEN. INSULATION TO SURROUNDING STRUCTURE SHALL BE COMPATIBLE WITH INSULATION REQUIREMENTS OF THE PARTICULAR VESSEL.
10. THE FOLLOWING IS A SUGGESTED PROCEDURE FOR BRAZING OF BUS BAR ENDS.
    (A) CHEMICALLY CLEAN AREAS TO BE BRAZED.
    (B) APPLY FLUX, (HANDY & HARMON A.W.S. TYPE 3 OR EQUAL) TO ALL SURFACES.
    (C) PLACE SILVER BRAZING ALLOY (RIBBON TYPE .003 INCH THICK) OVER TOTAL AREAS TO BE BRAZED. SILVER BRAZING ALLOY SHALL BE IN ACCORDANCE WITH MILITARY SPECIFICATION MIL-S-15395 GRADE 4, STK #G3432-262-4184.
    (D) CLAMP BUS ASSEMBLY TIGHTLY TOGETHER USING COPPER BLOCKS BETWEEN BUS WORK AND CLAMP JAWS TO AVOID ANY DAMAGE TO BUS ASSEMBLY.
    (E) ASSEMBLY MAY BE TORCH BRAZED IF DESIRED IN ACCORDANCE WITH "AMERICAN WELDING SOCIETY" BRAZING MANUAL, CHAPTER 39.
11. THIS FIGURE SUPERSEDES SHEET 2C11 OF DRAWING 803-5001027 AND SECTION 5, SHEET 153 OF DRAWING NAVSEC NO. 9000-S6202-73980.

FIGURE 2C11. Quick opening bus disconnect and end preparation.

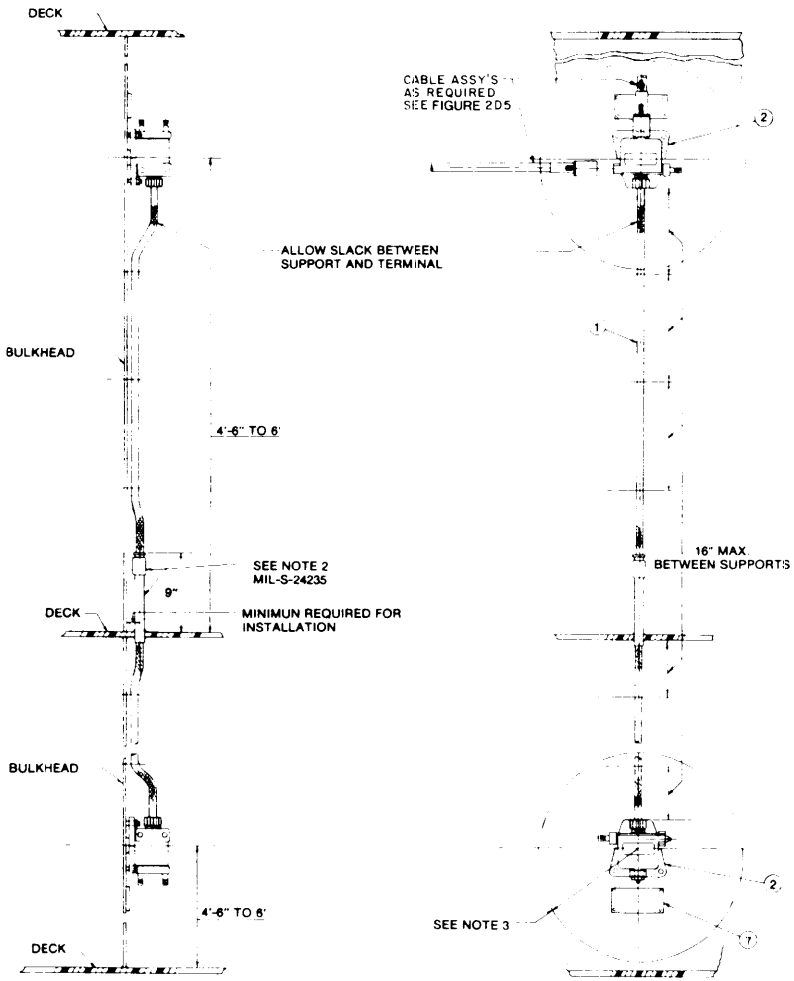


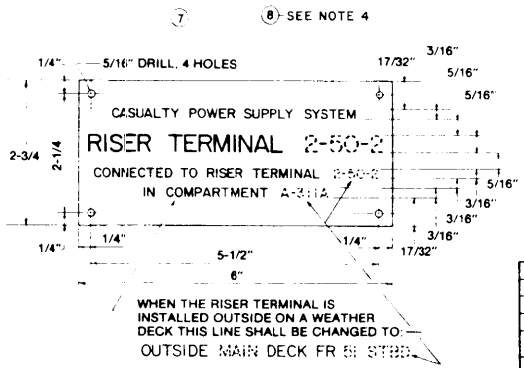
SH 132317048

FIGURE 2D1. Casualty power distribution system.

NOTES

1. THE CASUALTY POWER DISTRIBUTION SYSTEM SHALL BE ARRANGED TO PROVIDE TEMPORARY TRANSMISSION OF POWER TO SPAN DAMAGED AREAS IN ACCORDANCE WITH SECTION 320 OF THE SHIP SPECIFICATIONS
2. VERTICAL RISERS FOR TRANSMISSION OF POWER TO A DECK ABOVE OR BELOW SHALL BE INSTALLED IN ACCORDANCE WITH FIGURE 2D2
3. PORTABLE JUMPER CABLE ASSEMBLIES SHALL BE PROVIDED FOR CONNECTING RISER TERMINALS TO HORIZONTAL RUN BULKHEAD TERMINALS AND TO TERMINALS ON SWITCHBOARDS, PANELS AND CONTROLLERS IN ACCORDANCE WITH SHEET 2D5
4. CABLE STORAGE RACKS SHALL BE INSTALLED TO STOW THE PORTABLE JUMPER CABLE ASSEMBLIES IN COMPARTMENTS WHERE THE CABLE IS USED IN ACCORDANCE WITH FIGURE 2D4
5. TERMINALS MOUNTED ON EQUIPMENT ENCLOSURE SHALL BE INSTALLED IN ACCORDANCE WITH METHOD 2D32
6. BULKHEAD TERMINALS FOR HORIZONTAL FORE-AND-AFT CASUALTY POWER RUNS SHALL BE INSTALLED IN ACCORDANCE WITH METHODS 2D31 AND 2D33
7. WHEN EQUIPMENT ENCLOSURE IS WATERTIGHT THE SEAL MIL-T-24552/3 SHALL BE USED
8. THIS FIGURE SUPERSEDES SHEET 2D1 OF DRAWING 803-5001027





MARKING SHOWN IN DOTTED IS TYPICAL ONLY AND SHOULD INDICATE THE ACTUAL LOCATION IN THE VESSEL

NOTES:
1. THE RISER SHALL BE INSTALLED AS SHOWN OR IN ACCORDANCE WITH SPECIFICALLY APPROVES SPECIFICATIONS.
2. STUFFING TUBE SHALL BE OF THE TYPE REQUIRED FOR THE PARTICULAR DECK CONSTRUCTION WHERE INSTALLED.
3. A 12" RADIUS MINIMUM HANDLING CLEARANCE SHALL BE MAINTAINED ABOUT CENTER OF RISER TERMINALS AS SHOWN.
4. NAMPLATES SHALL COMPLY WITH SPEC MIL-P-15024, TYPE B,BE MARKED AS SHOWN. PIECE 8 IS THE SAME AS PIECE 7 EXCEPT MARKED "BULKHEAD TERMINAL" IN LIEU OF "RISER TERMINAL".
5. SEE FIGURE 2D6 FOR WIRING AND INSTALLATION OF TERMINALS.
6. THIS FIGURE SUPERSEDES SHEET 2D2 OF DRAWING 803-5001027

FIG NO	QTY	NAME	MATERIAL	MATL SPEC OR STD DRG NO
9	—	WIRE		MIL-W-16878/8 TYPE E
8	AS REQD	NAMEPLATE - BHD	BRASS	SEE NOTE 4
7	2	NAMEPLATE - RISER	BRASS	SEE NOTE 4
6	—	CABLE, THOF-42	—	MIL-C-915/6
5	—	TERM, CASUALTY PWR, PLUG, SYM. NO. 1049	—	MIL-T-24552/4
4	—	TERM, CASUALTY PWR, SEAL, SYM. NO. 1048	—	MIL-T-24552/3
3	—	TERM, CASUALTY PWR, RECP TYPE, BC, SYM. NO. 1046	—	MIL-T-24552/1
2	—	TERM, CASUALTY PWR, RCPT TYPE, UPR & LWR R, SYM. NO. 1047	—	MIL-T-24552/2
1	—	CABLE, TSGU-75	—	MIL-C-915/30

LIST OF MATERIAL - QUANTITIES FOR ONE UNIT

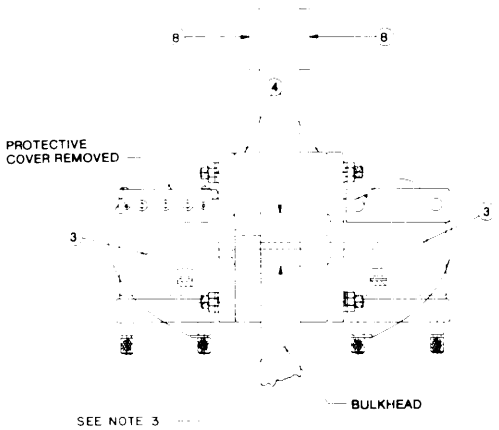
SH 132317049

FIGURE 2D2. Casualty power riser terminal.

NOTES:

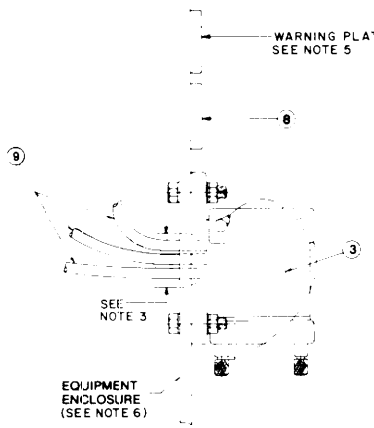
1. PARTS IN ○ ARE SHOWN ON FIGURE 2D2 .
2. METHOD 2D3-2 IS SHOWN FOR NWT INSTALLATIONS. SEAL, Pc 4 ON FIGURE 2D2, SHALL BE USED FOR ALL OTHER INSTALLATIONS.
3. A 2 INCH DIAMETER OPENING IN EQUIPMENT ENCLOUSURE OR BULKHEAD IS REQUIRED.
4. SEE FIGURE 2D6 FOR WIRING AND INSTALLATION OF TERMINALS.
5. NORMALLY ENERGIZED CASUALTY POWER TERMINALS (THOSE CONNECTED TO TRANSFORMERS, POWER PANELS OR MOTOR CONTROLLERS) SHALL HAVE A WARNING PLATE INSTALLED INSCRIBED AS SHOWN IN METHOD 2D3-4. PLATE SHALL BE TYPE B (BRASS) OF MIL-P- 15024.
6. WHEN EQUIPMENT ENCLOSURE IS TIGHT WATERTIGHT THEN SEAL MIL-T-24552/3 SHALL BE USED.
7. THIS FIGURE SUPERSEDES SHEET 2D3 OF DRAWING 803-5001027.

2D31



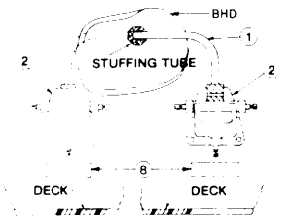
TYPICAL CASUALTY POWER,
BULKHEAD TERMINAL ASSEMBLY

2D32
SEE NOTE 2



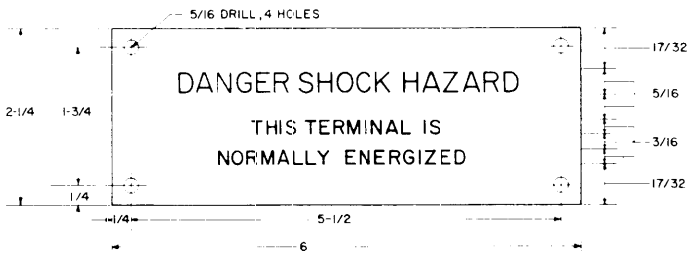
TYPICAL CASUALTY POWER
TERMINAL MOUNTED ON
EQUIPMENT ENCLOSURE

2D33



ALTERNATE BULKHEAD
TERMINAL ASSEMBLY

2D34



WARNING PLATE

SH 132317050

FIGURE 2D3. Casualty power bulkhead terminal.

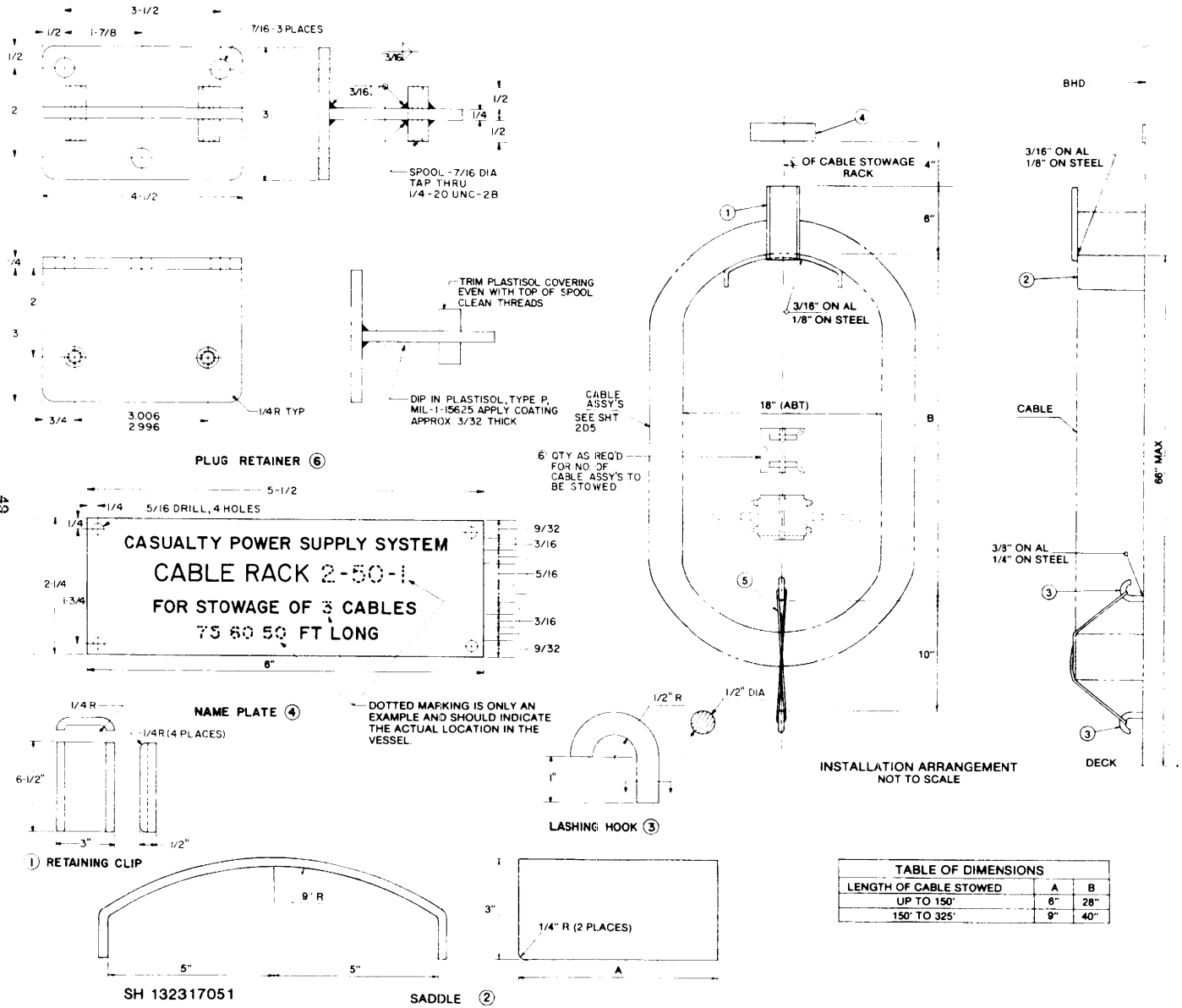


TABLE OF DIMENSIONS		
LENGTH OF CABLE STOWED	A	B
UP TO 150'	6"	28"
150' TO 325'	9"	40"

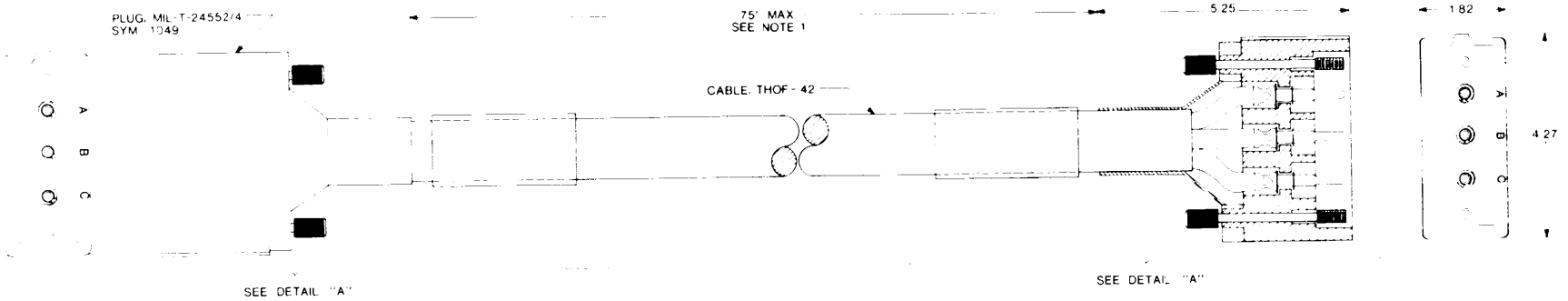
NOTES:

1. SADDLE & RERTAINING CLIP TO BE MILD STEEL OF WELDABLE AND DRAWABLE QUALITY FOR STEEL BULKHEADS AND ALUMINUM ALLOY SPEC. QQ-A-250/8, FOR ALUMINUM BULKHEADS.
2. DEPTH OF SADDLE AND LOCATION OF LASHING HOOKS TO BE DETERMINED BY AMOUNT OF CABLE STOWED.
3. BRACKETS SHALL NOT BE WELDED ON ALUMINUM BHDS LESS THAN 1/8" THICK WITHOUT PROPER REINFORCEMENT.
4. AFTER INSTALLATION THE ENTIRE FIXTURE SHALL BE PAINTED TO MATCH SURROUNDING STRUCTURE.
5. ALL STEEL OR ALUMINUM PARTS SHALL BE ASSEMBLED BY WELDING AS SPECIFIED.
6. ALL SHARP CORNERS SHALL BE SLIGHTLY ROUNDED.
7. BOTH ENDS OF LASHING SHALL BE SERVED. LASHING NOT FURNISHED.
8. WHEN RACK ASSEMBLY IS MOUNTED ON STEEL BHDS ALL STEEL PARTS SHOULD BE ZINC PLATED TO CONFORM TO THE REQUIREMENTS OF SPEC. QQ-Z-325, TYPE 1, CLASS 2.
9. IDENTIFICATION PLATES SHALL BE TYPE B (BRASS) OF MIL-P-15024 & SHALL BE MARKED AS SHOWN.
10. LASHING HOOK TO BE 1/2" DIA MILD STEEL KSM J WELDING PIN OR 1/2" DIA ROD SPEC. QQ-S-741 ON STEEL BHDS & 1/2" DIA ALUMINUM ALLOY KSM J WELDING PIN OR 1/2" DIA ALUMINUM ALLOY QQ-A-225/7 ON ALUMINUM BHDS.
11. STOWAGE RACK SHALL PASS HI SHOCK TEST PER MIL-S-901 WHILE SUPPORTING COIL OF 75 FEET OF THOF-42 CABLE OR 72 POUND EQUIVALENT DUMMY WEIGHT.
12. THIS FIGURE SUPERSEDES SHEET 2D4 OF DRAWING 803-5001027 AND SECTION 3, SHEET 123 OF DRAWING NAVSEC NO. 9000-S6202-73980.

NO.	QTY	NAME	MATERIAL	MAT. SPEC. OR STD. DWG. NO.
6	AS REQD.	PLUG RETAINER	STEEL	-
5	1	LASHING 36" LG 1/4" THK	HEMP	T-R-650 SEE NOTE 7
4	1	NAME PLATE	ALUM	SEE NOTE 9
3	2	LASHING HOOK	NOTE 10	SEE NOTES 8 & 10
2	1	SADDLE	NOTE 1	SEE NOTES 1 & 8
1	1	RETAINING CLIP	NOTE 1	SEE NOTES 1 & 10

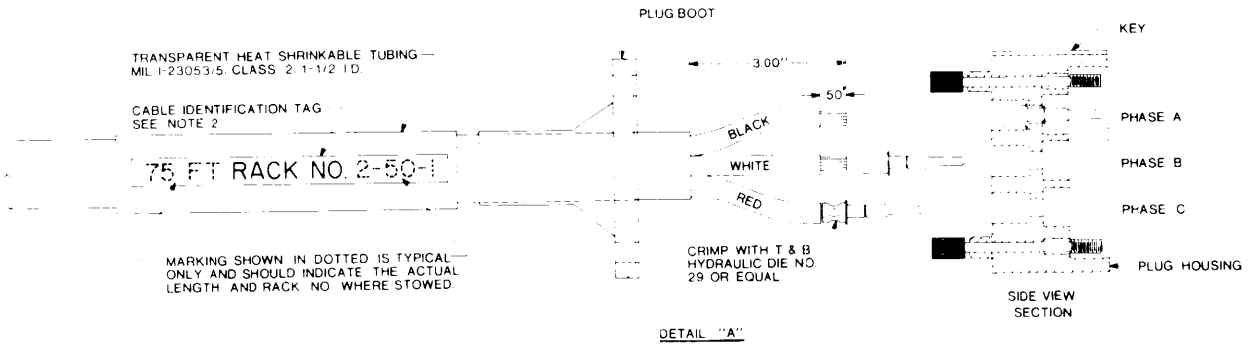
LIST OF MATERIAL - QUANTITIES FOR ONE UNIT

FIGURE 2D4. Casualty power cable stowage rack.



NOTES:

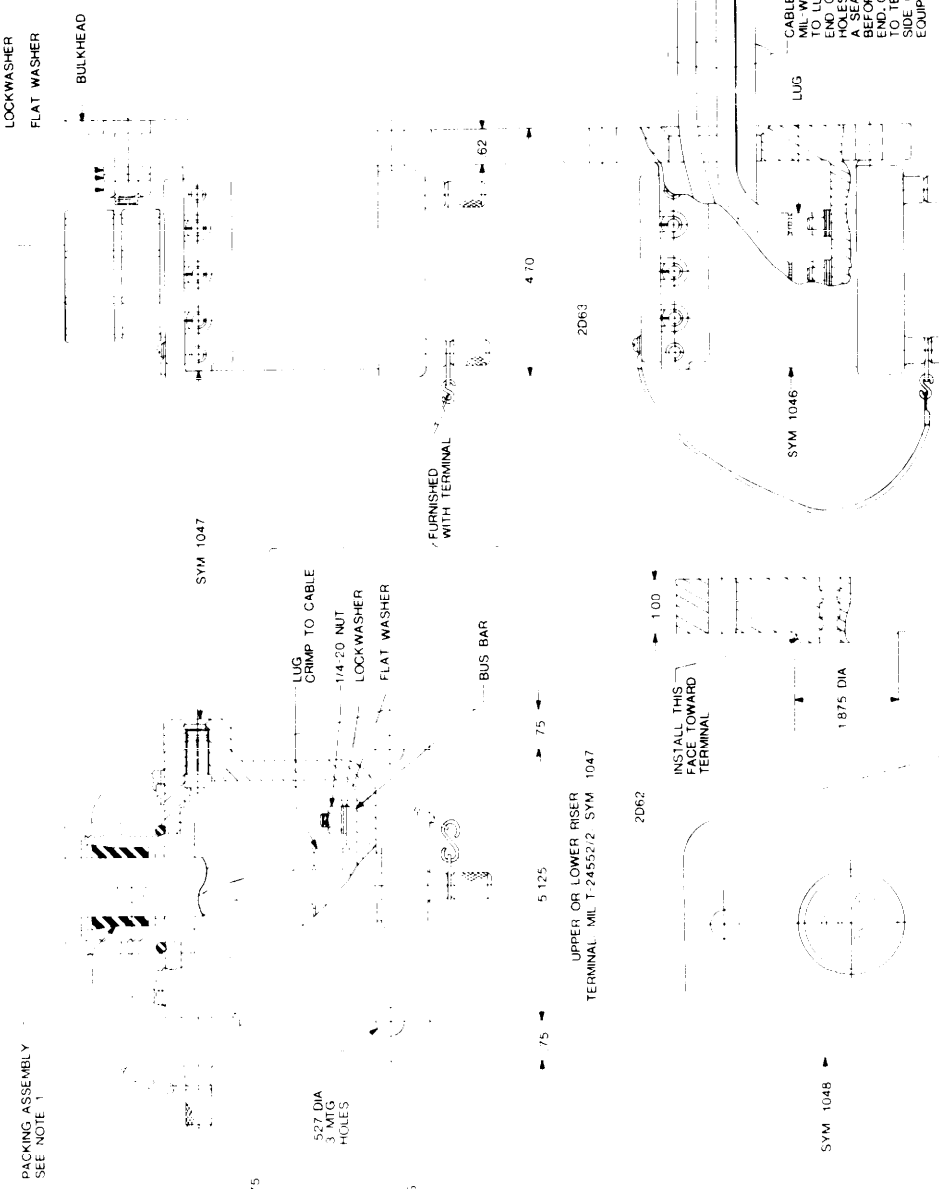
1. CABLE LENGTH SHALL NOT EXCEED 75 FEET IN LENGTH UNLESS APPROVED BY THE SUPERVISOR.
2. EACH CABLE END SHALL BE MARKED AS SHOWN.
3. THIS FIGURE SUPERSEDES SHEET 2D5 OF DRAWING 803-5001027.



SH 132317052

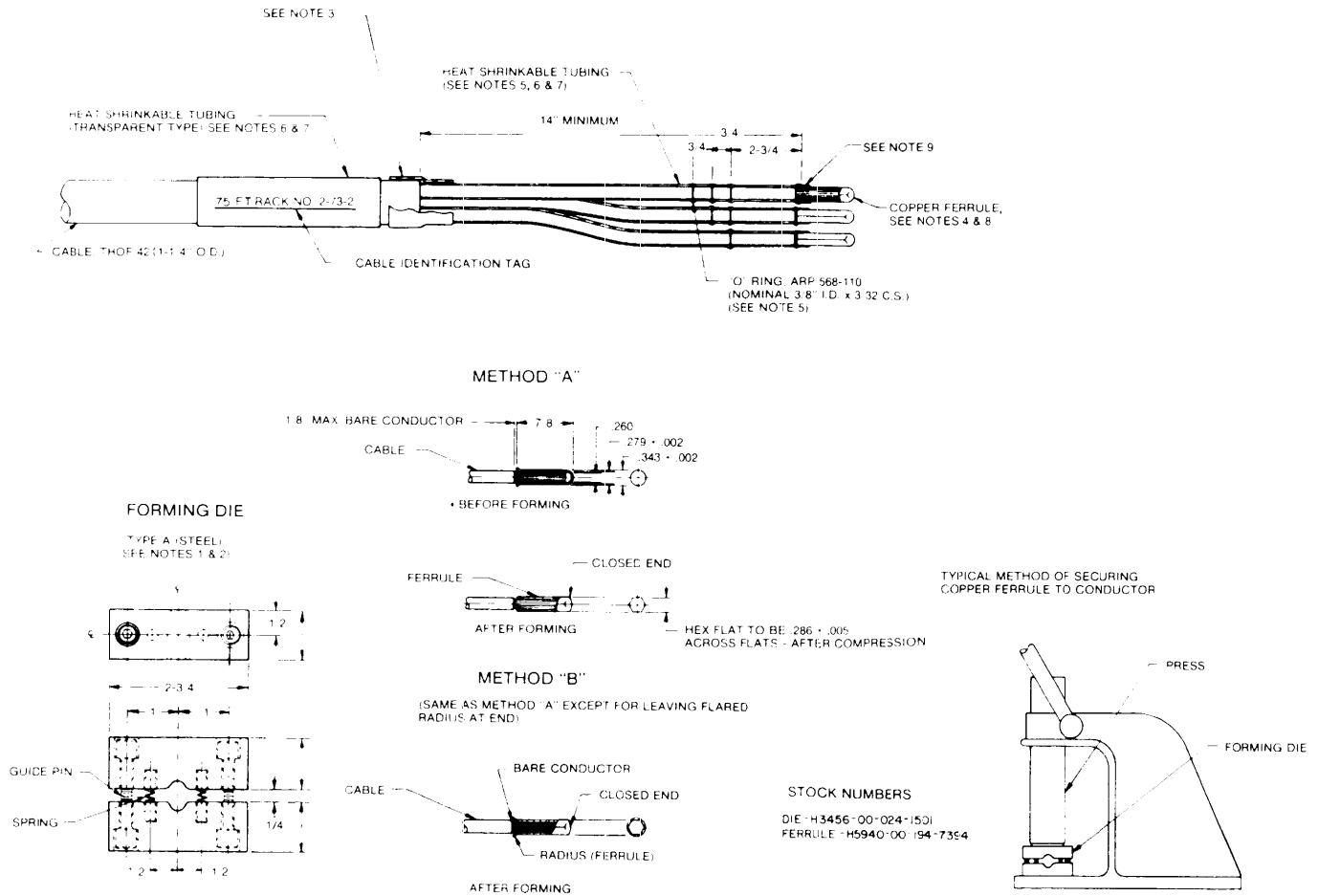
FIGURE 2D5. Casualty power jumper cable assembly.

NOTES:
1. PACKING ASSEMBLY MIL-S-19622/20-009. NSN 5975-00-202-2607 FOR SIZE 5 STUFFING TUBE TO BE FURNISHED BY INSTALLING ACTIVITY. SYM. 1047 ONLY.
2. THIS FIGURE SUPERSEDES SHEET 2D6 OF DRAWING 803-5001027.



SH 132317053

FIGURE 2D6. Casualty power terminal preparation.



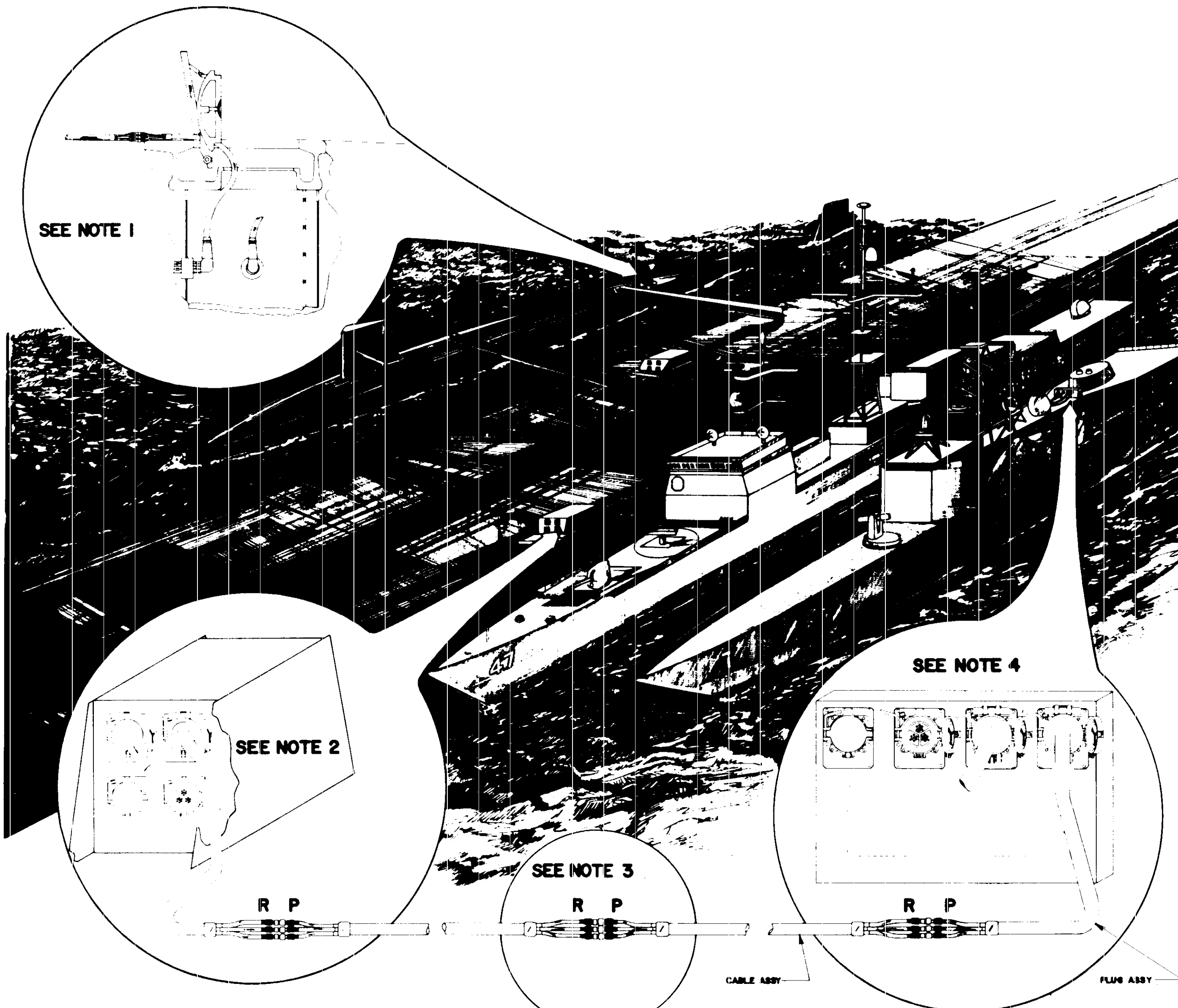
SH 132317054

NOTES:

1. FORMING DIE SHALL BE SO CONSTRUCTED AS TO PREVENT DISASSEMBLY WHILE HANDLING.
2. SPRINGS SHALL BE OF A TYPE AND DESIGN THAT WILL HOLD THE DIE HALVES NORMALLY IN THE OPEN POSITION
3. EXPOSED END OF CABLE SHEATH INSULATION AT CROTCH, SHALL BE MADE EFFECTIVELY WATERTIGHT BY USE OF HEAT SHRINKABLE BOOT.
4. PLACE ROUND COPPER FERRULE ON CONDUCTOR AND SECURE BY FORMING AS SHOWN IN DETAIL BY METHOD "A" OR "B".
5. FOR PHASE IDENTIFICATION BY TOUCH INSTALL HEAT SHRINK TUBING SEE NOTES 6 &7 AND NON-METALLIC "O" RINGS. FSN 5330-002050-1211 MIL-P-5516 OR EQUIV. BLACK WIRE ("A" PHASE) 1 "O" RINGS BLACK H.S. TUBE WHITE WIRE ("A" PHASE 2 "O" RINGS WHITE H.S. TUBE RED WIRE ("C" PHASE) 2 "O" RINGS RED H.S. TUBE
6. PHASE AND CABLE IDENTIFICATION:
   A. HEAT SHRINKABLE TUBING FOR PHASE IDENTIFICATION SHALL BE FLEXIBLE TYPE, MIL-I-23063/5 CLASS 1 OR EQUIV. IF COLORED TUBING IS NOT AVAILABLE FOR PHASE IDENTIFICATION, USE TRANSPARENT TYPE TUBING PER MIL-I-23063/5 CLASS 2.
   B. FOR CABLE IDENTIFICATION , USE TRANSPARENT FLEXIBLE TUBING PER MIL-I-23063/5 CLASS 2.
7. TUBING SIZE AS SUPPLIED:
   FOR CABLE IDENTIFICATION - 1-1/2 I.D.
   FOR PHASE IDENTIFICATION - 3/4 I.D.
   1/2 AND 2-3/4 INCH LENGTHS.
8. PULL OUT STRENGTH OF FERRULE SHALL BE AT LEAST 150 POUNDS. IF THIS CANNOT BE ACCOMPLISHED BY FORMING OF FERRULE DIRECTLY OVER CONDUCTOR, ADD A FEW COPPER STRANDS IN SPACE BETWEEN CONDUCTOR AND FERRULE BEFORE FORMING AFTER THE FERRULES ARE FORMED ON THE CONDUCTORS , REMOVE ANY SHARP FINS AND EDGES, REPLACE FERRULES CRACKED IN FORMING.
9. HEAT SHRINK TUBING SHALL EXTEND OVER THE FERRULE APPROX. 1/8" FOR WATERTIGHT EFFECTIVENESS.
10. THIS FIGURE SUPERSEDES SHEET 2D7 OF DRAWING 803-5001027 AND SECTION 4, SHEET 92, OF DRAWING NAVSEC NO. 9000-S8202-73980.

REPAIR ONLY
NOT FOR NEW CONSTRUCTION

FIGURE 2D7. Casualty power cable assembly for MIL-T-24381 equipment.



NOTES:

1. TYPICAL SHORE POWER INSTALLATIONS FOR SUBMARINES ARE SHOWN ON FIGURE 2E13 AND 2E14.
2. TYPICAL SHORE POWER INSTALLATIONS FOR SHORE ACTIVITIES ARE SHOWN IN NAVAL FACILITIES ENGINEERING COMMAND DESIGN MANUAL - DM-25.
3. IN-LINE CONNECTOR INSTALLATIONS IN ACCORDANCE WITH FIGURE 2E17 ARE USED TO CONNECT CABLE ASSEMBLIES TO SHORE POWER PLUGS. FOR EASE OF HANDLING, APPROXIMATELY 10 FEET OF THOF-500 CABLE (15 FEET OF THOF-500 CABLE FOR SUBMARINES) IS USED FOR EACH PLUG ASSEMBLY AND APPROXIMATELY 150 FEET OF THOF-500 CABLE FOR EACH CABLE ASSEMBLY. IN-LINE CONNECTORS SHALL NOT BE USED IN LIEU OF A SPLICE OF SHORT RUN CABLES. FURTHER, IN-LINE CONNECTORS MAY BE OMITTED IN FAVOR OF A CONTINUOUS LENGTH OF CABLE.
4. TYPICAL SHORE POWER INSTALLATION FOR SURFACE SHIPS ARE SHOWN ON FIGURES 2E1 - 2E13.
5. PORTABLE SHORE-TO-SHIP POWER CABLES ARE THE RESPONSIBILITY OF THE SHORE ACTIVITY. PORTABLE SHIP-TO-SHIP OR SHIP-TO-SHORE CABLES ON BOARD SHIP (TENDERS, REPAIR SHIPS, ETC) ARE THE RESPONSIBILITY OF THE SHIP. SPLICING OF SHORE POWER CABLES IS NOT RECOMMENDED. IF THEY CAN NOT BE AVOIDED, SPLICES AND CABLE JACKET REPAIR SHOULD BE IN ACCORDANCE WITH THE HOT SPLICE VULCANIZED NEOPRENE METHOD DESCRIBED IN THE CIVIL ENGINEERING (NAVAL CONSTRUCTION AND BATTALION CENTER, PORT HUENEME, CA 93043) TECHNICAL NOTE TN NO N-1503.
6. THIS FIGURE SUPERSEDES SHEET 2E1 OF DRAWING 803-5001027.

LEGEND:

P - PLUGS } SEE FIGURE 2E13 & 2E17
R - RECEPTACLES }

SH. 13231798

FIGURE 2E1. Shore power installations.

NOTES:
1. SEE FIGURE 2E16 AND 2E18 FOR INSTALLATION DETAILS OF RECEPTACLES.
2. CONFIGURATION OF SHORE POWER STATION AS SHOWN HEREON IS OPTIMUM AND SHOULD BE FOLLOWED TO THE GREATEST EXTENT POSSIBLE.
3. THIS FIGURE SUPERSEDES SHEET 2E2 OF DRAWING 803-5001027 AND SECTION 4, SHEET 192, OF DRAWING NAVSEC NO. 9000-S6202-7398.

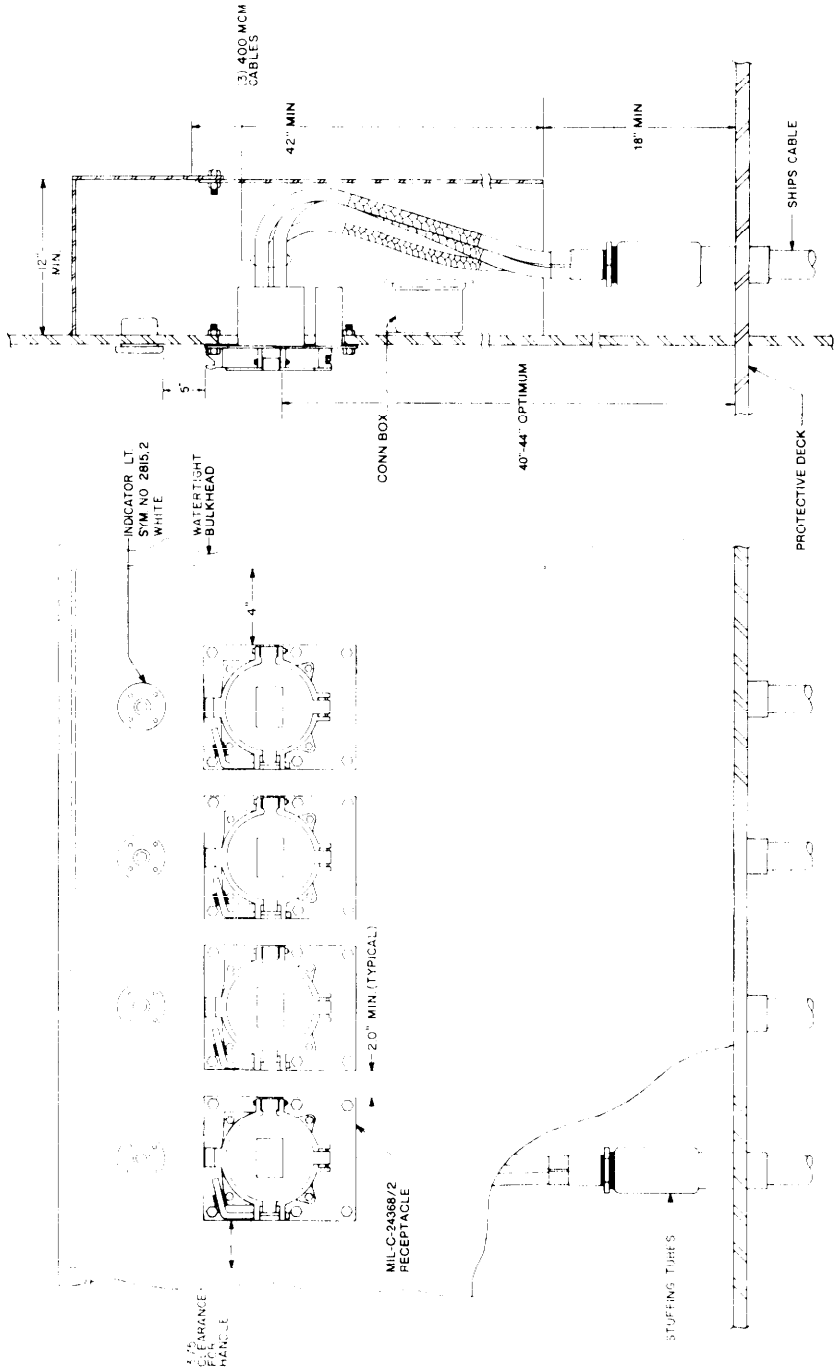


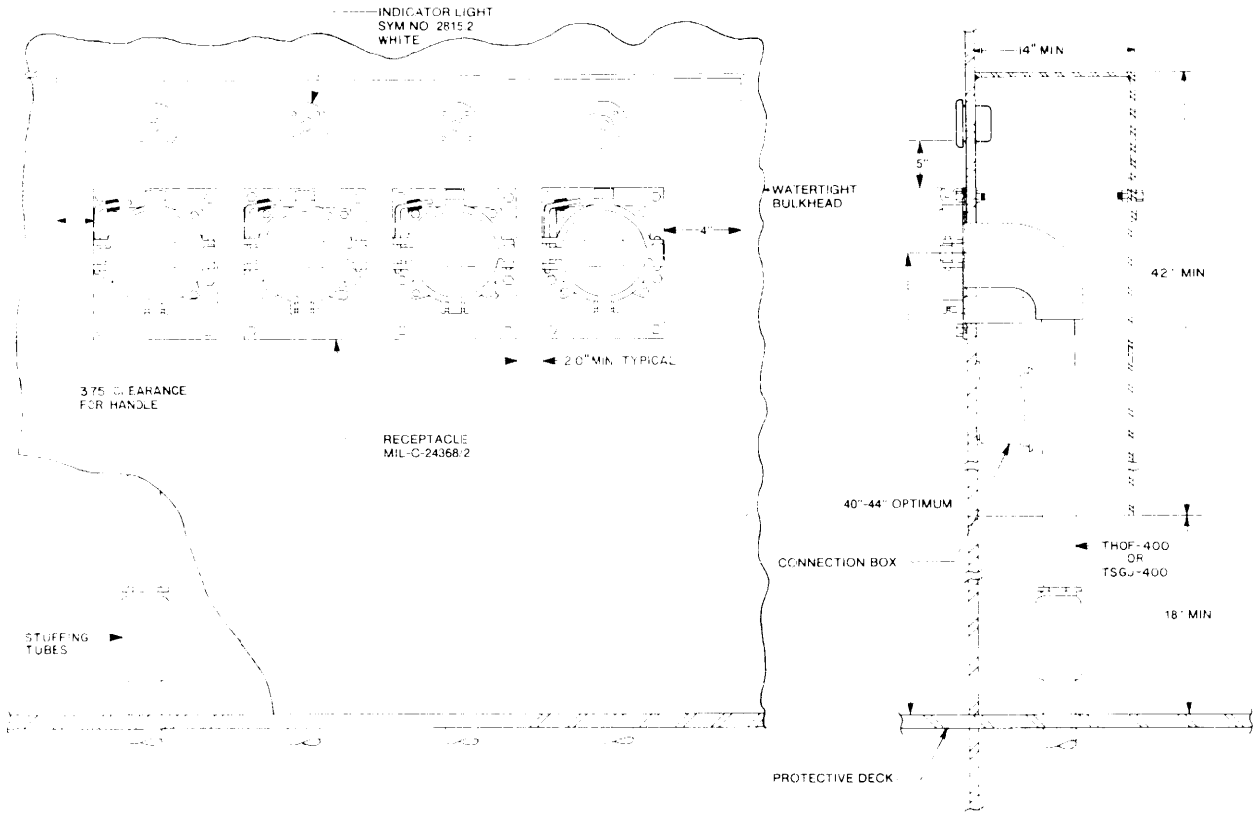
FIGURE 2E2. Mounting shore power receptacles inside of bulkheads.

SH 132317055

4.4.1 Standard test conditions. Unless otherwise specified (see 3.1),

NOTES:

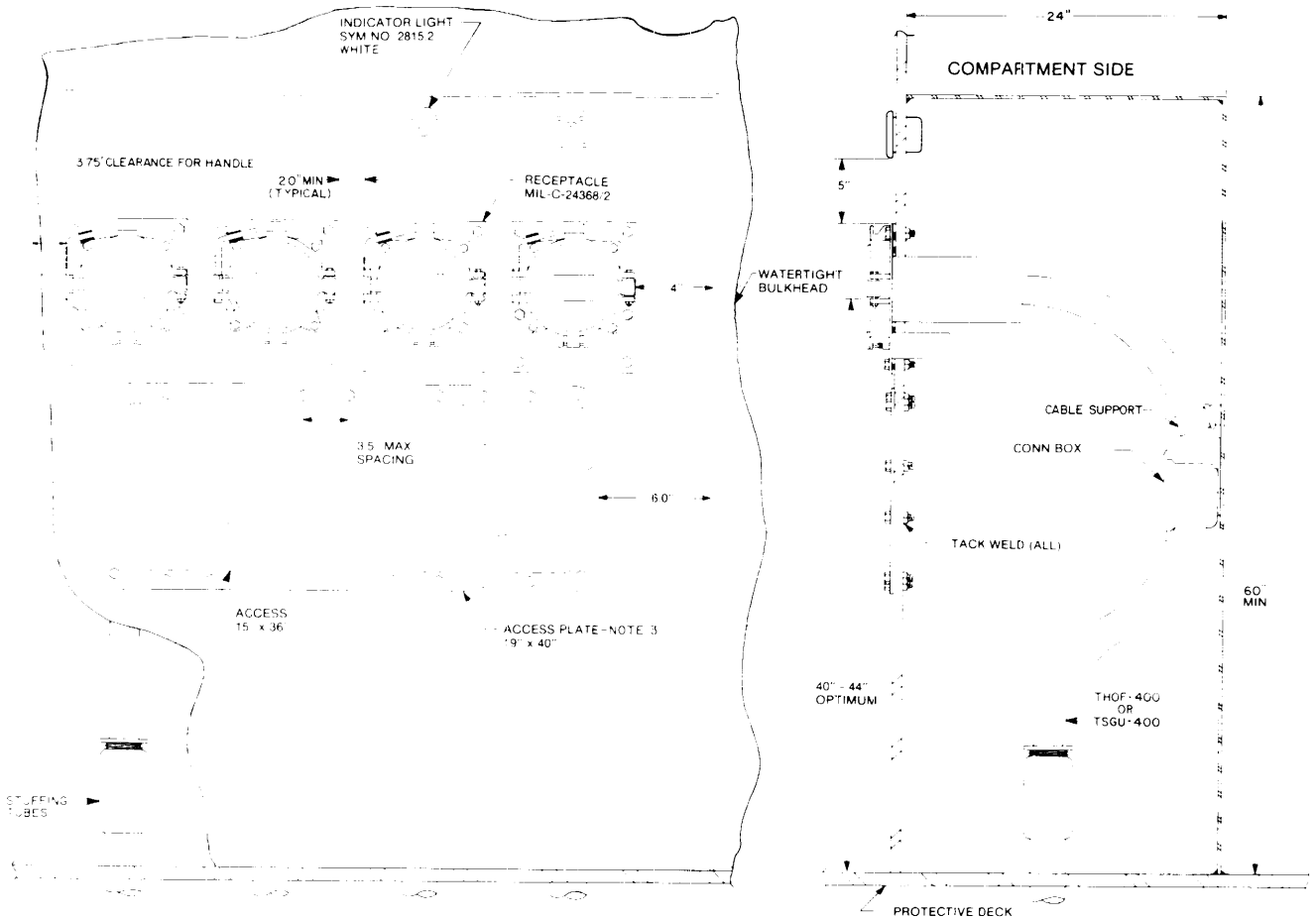
1. SEE FIGURE 2E16 AND 2E18 FOR INSTALLATION DETAILS OF RECEPTACLES.
2. CONFIGURATION OF SHORE POWER STATION SHOWN HEREON IS OPTIMUM AND SHOULD BE FOLLOWED TO THE GREATEST EXTENT POSSIBLE.
3. THIS FIGURE SUPERSEDES SHEET 2E3 OF DRAWING 803-5001027.



SH 132317056

SHORE POWER STATION

FIGURE 2E3. Mounting shore receptacles with 90° potting inside of bulkhead.



SHORE POWER STATION

SH 132317057

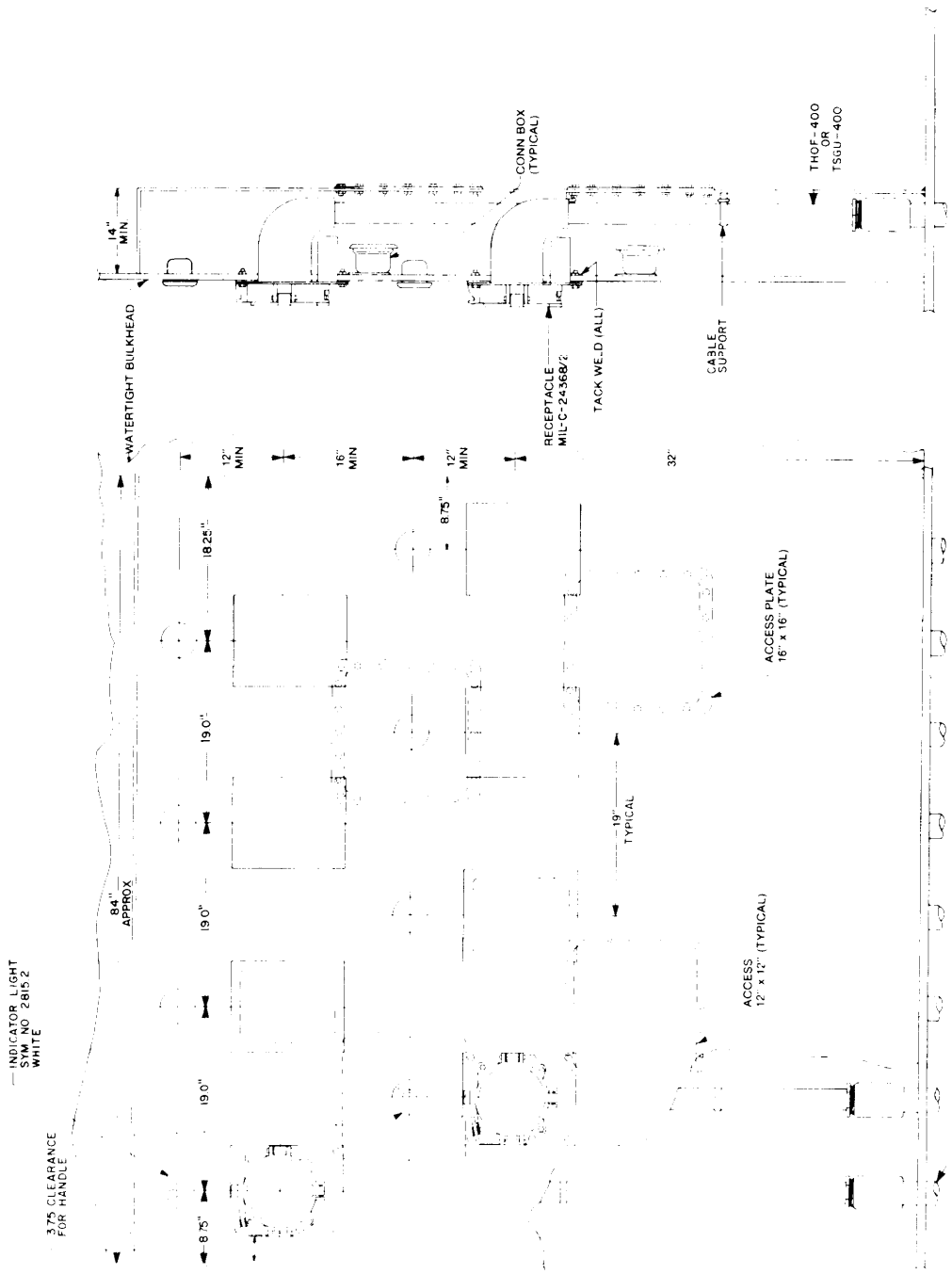
FIGURE 2E4. Mounting shore power receptacles inside of bulkhead.

NOTES:

1. SEE FIGURE 2E16 AND 2E18 FOR INSTALLATION DETAILS OF RECEPTALES.
2. CONFIGURATION OF SHORE POWER STATION AS SHOWN HEREON IS OPTIMUM AND SHOULD BE FOLLOWED TO THE GREATEST EXTENT POSSIBLE.
3. STRENGTH OF ACCESS PLATE SHALL BE EQUIVALENT TO BULKHEAD. FRONT ACCESS SHALL BE PROVIDED ONLY WHEN ACCESS FROM THE COMPARTMENT SIDE CANNOT BE PROVIDED.
4. THIS FIGURE SUPERSEDES SHEET 2E4 OF DRAWING 803-5001027.

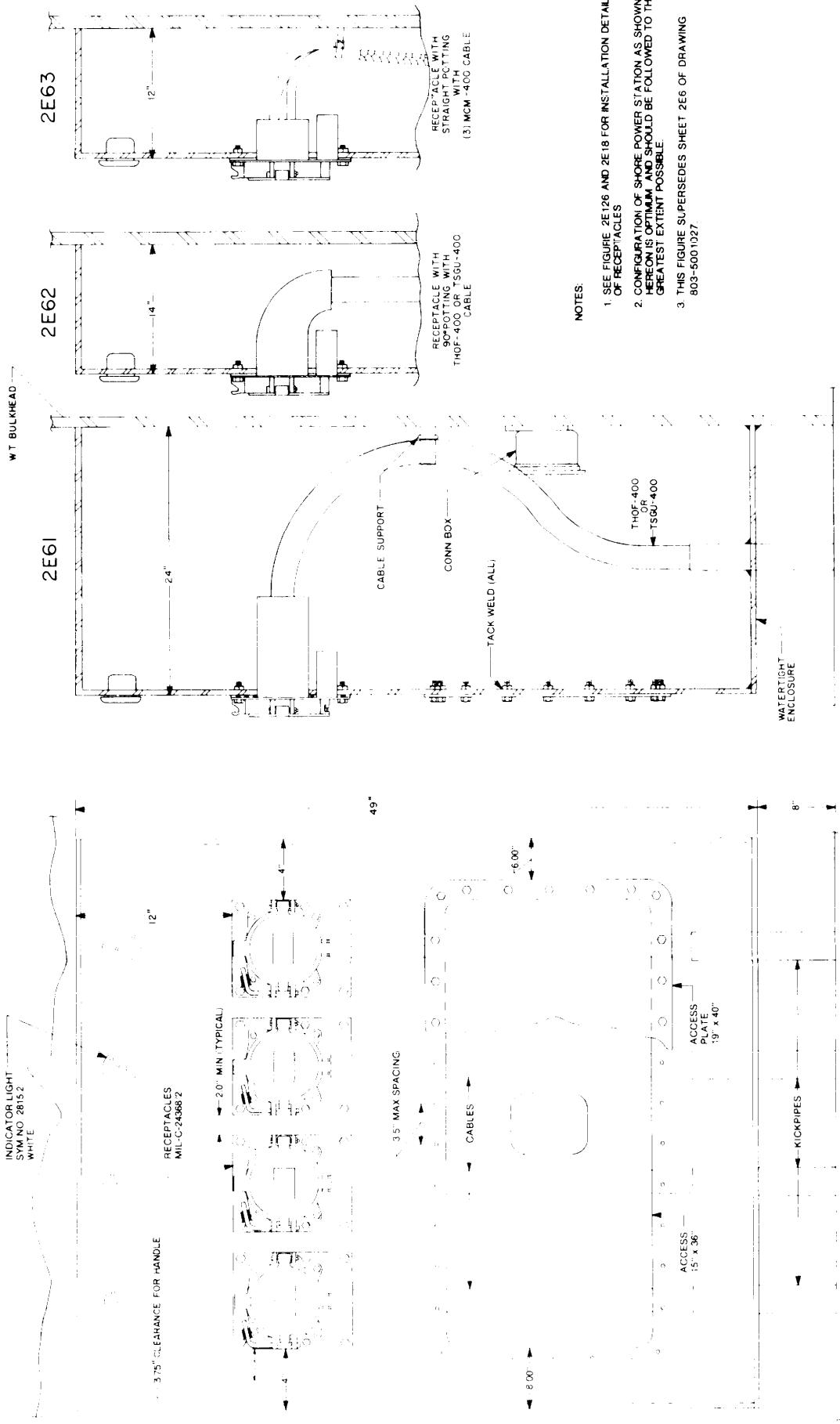
NOTES:

1. SEE FIGURE 2E16 AND 2E18 FOR INSTALLATION DETAILS OF RECEPTACLES
2. CONFIGURATION OF SHORE POWER STATION AS SHOWN HEREON IS OPTIMUM AND SHOULD BE FOLLOWED TO THE GREATEST EXTENT POSSIBLE.
3. THIS FIGURE SUPERSEDES SHEET 2E5 OF DRAWING 803-5001027



SHORE POWER STATION
SH 132317058

FIGURE 2E5. Stagger mounting of shore power receptacles with 90° potting inside of bulkhead.



SHORE POWER STATION
SH 132317059

FIGURE 2E6. Mounting shore power receptacles outside of bulkhead.

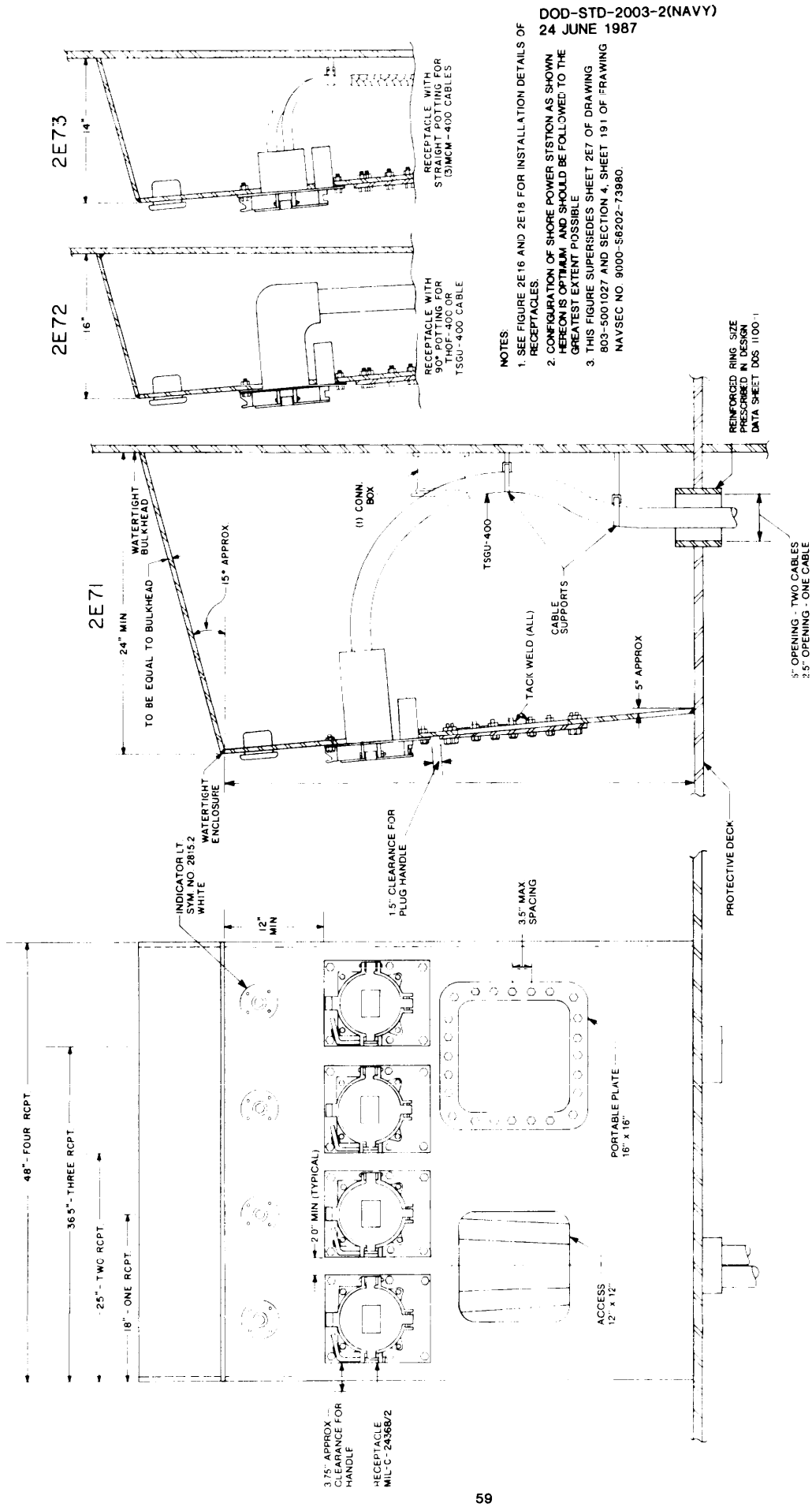
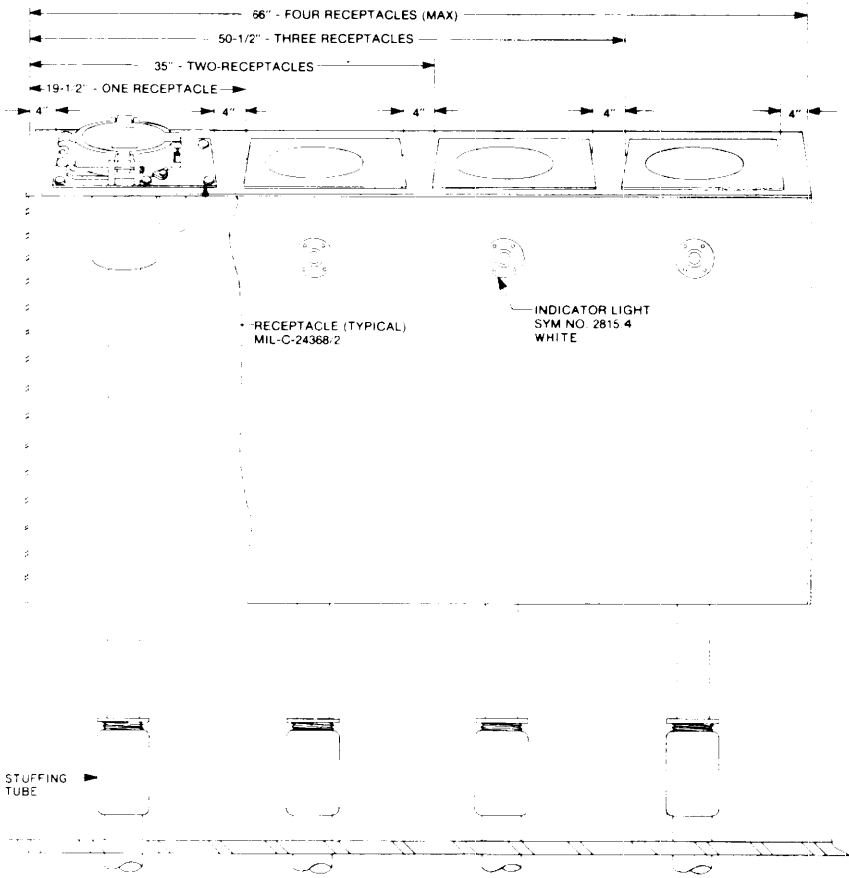


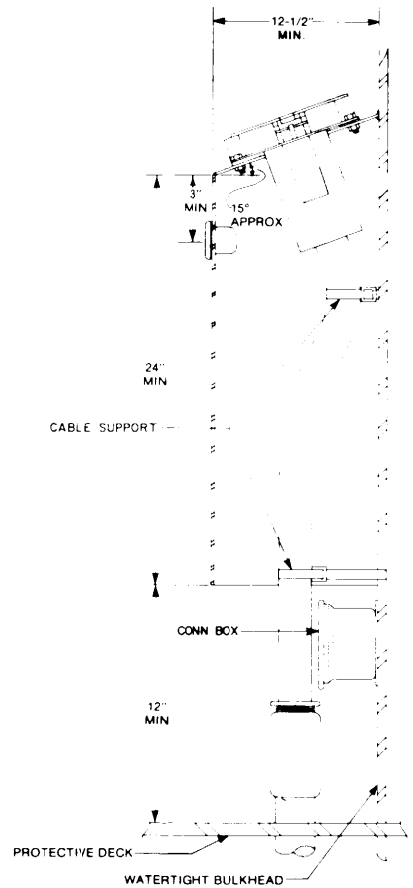
FIGURE 2E7. Mounting shore power receptacles outside of bulkhead.

SH 132317060

measurements. Alternatively, the resultant measurements shall be

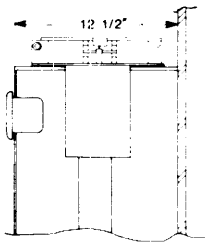


2E81

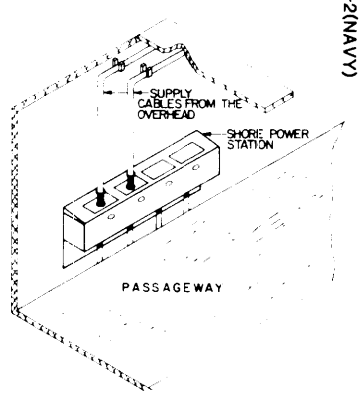


NOTES:

1. SEE FIGURE 2E16 f & 2E18 FOR INSTALLATIONS DETAILES OF RECEPTACLES
2. CONFIGURATION OF SHORE POWER STATION AS SHOWN HEREON IS OPTIMUM AND SHOULD BE FOLLOWED TO THE GREATEST EXTENT POSSIBLE.
3. THIS METHOD SHALL BE USED ONLY IN PROTECTED AREAS SUCH AS PASSAGEWAYS, STOREROOMS, AND SIMILAR COMPARTMENTS NOT EXPOSED TO THE WEATHER.
4. THIS FIGURE SUPERSEDES SHEET 2E8 OF DRAWING 803-5001027.



2E82



SH 132317061 SHORE POWER STATION

FIGURE 2E8. Incline mounted shore power receptacles in protected areas.

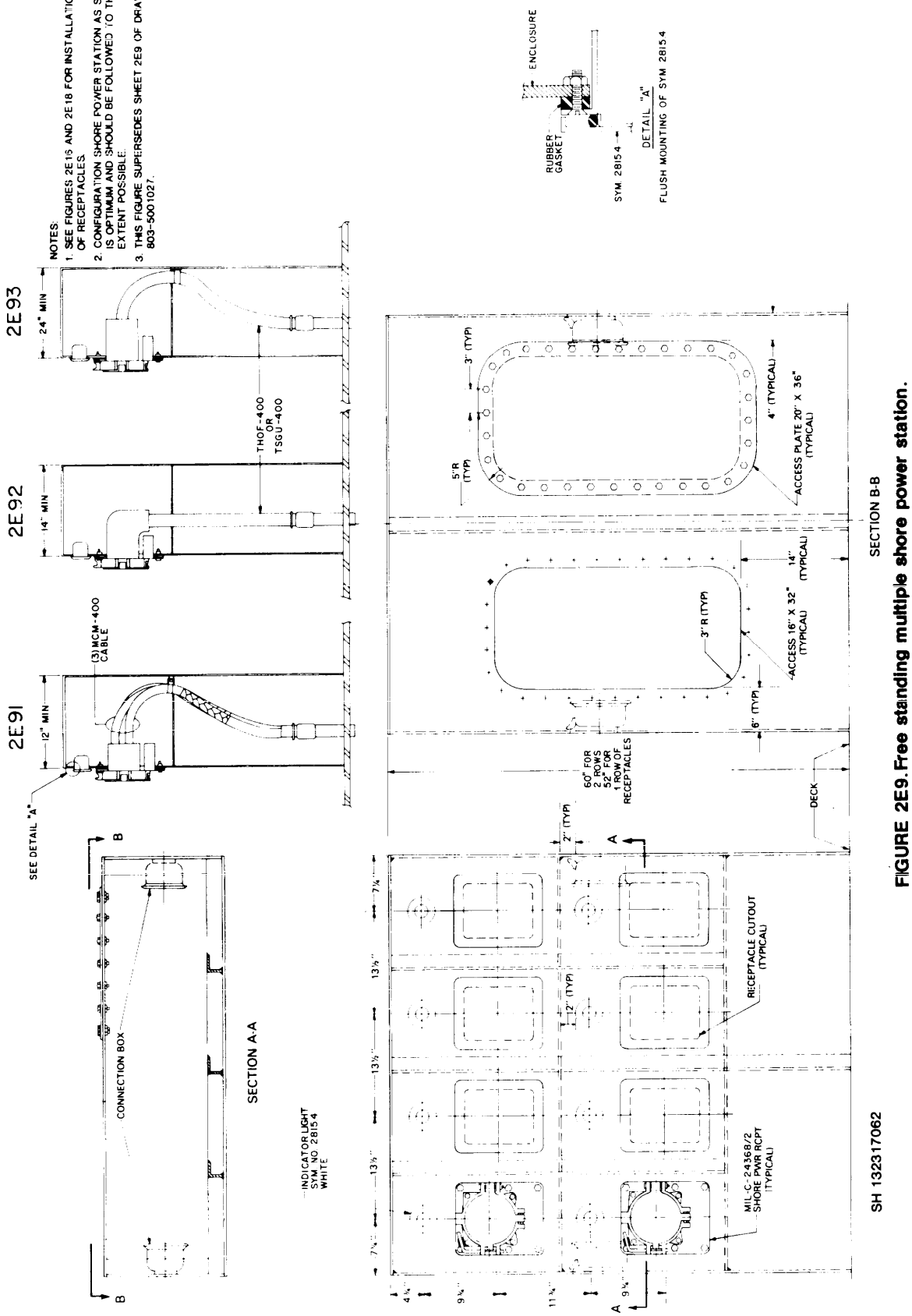
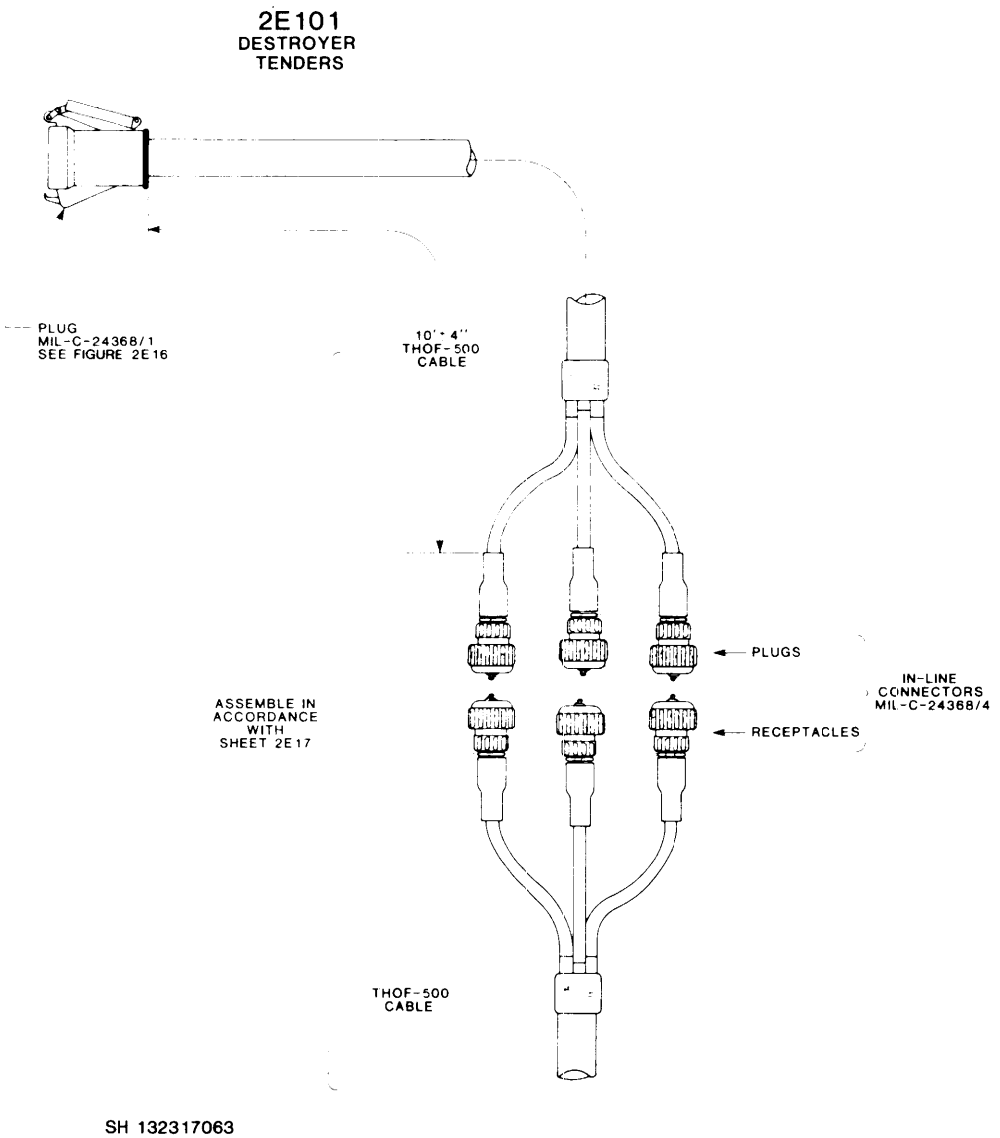


FIGURE 2E9. Free standing multiple shore power station.

measurement equipment. . corrected for the effects of the

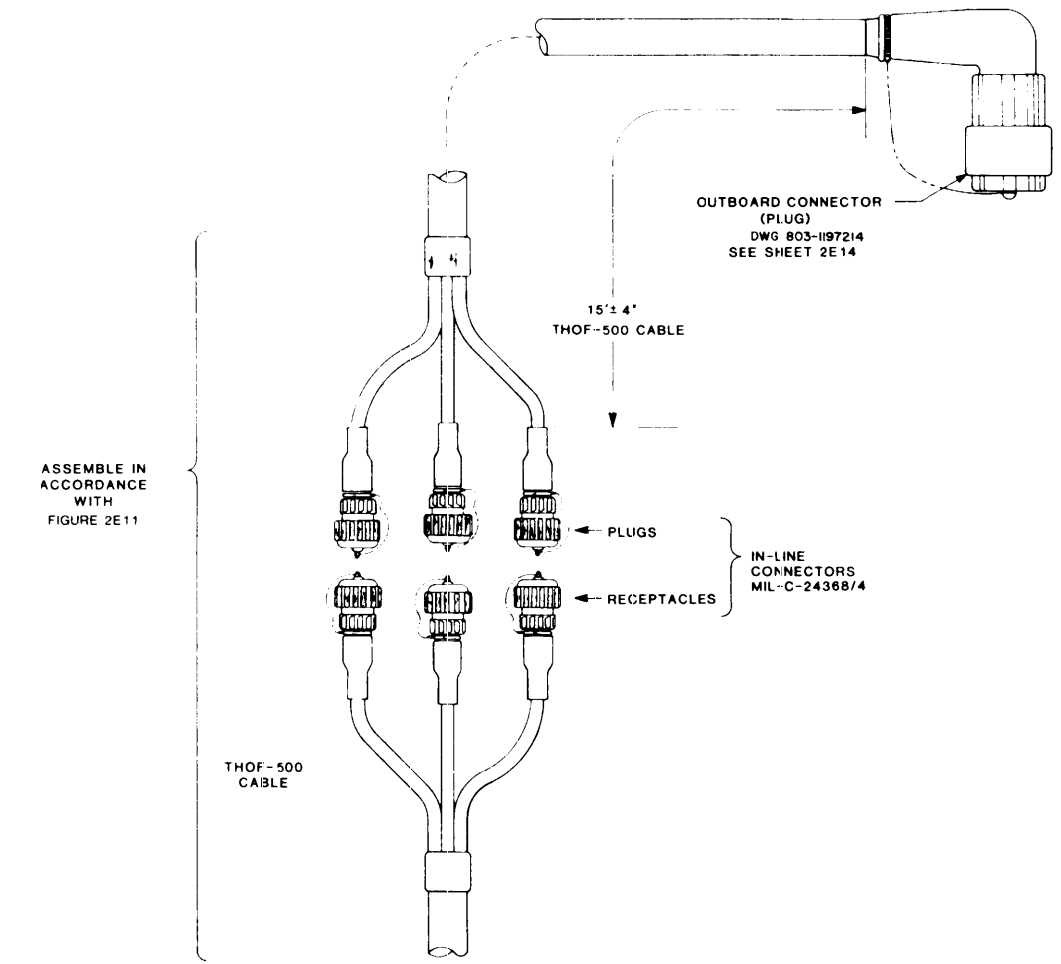


NOTES:

1. CABLE ASSEMBLY METHODS 2E10 IS PERMITTED ON DESTROYER TENDER AND REPAIR SHIPS TO JOIN TWO LENGHTS OF CABLE TOGETHER EVERY EFFORT SHOULD BE MADE TO INSTALL THE REQUIRED LENGHT OF CABLE IN LIEU OF USING IN-LINE CONNECTIONS.
2. THIS FIGURE SUPERSEDES SHEET 2E10 OF DRAWING 803-5001027

FIGURE 2E10. In-line connectors on alongside power cables.

2E111
SUBMARINE TENDERS



NOTES:

1. CABLE ASSEMBLY METHOD 2E11 IS PERMITTED ON SUBMARINE TENDERS WHEN IT IS NECESSARY TO REPLACE A DAMAGED DWG. 803-1197214 TYPE PLUG CONNECTOR THE TENDER MAY PURCHASE A 15 FOOT LENGHT OF CABLE WITH A DWG. 803-1197214 TYPE PLUG CONNECTOR AT ONE END. THIS CABLE MAY BE CONNECTED TO THE ALONGSIDE POWER CABLE VIA IN-LINE CONNECTORS.
2. THIS FIGURE SUPERSEDES SHEET 2E11 OF DRAWING 803-5001027.

SH 132317064

FIGURE 2E11. In-line connectors on alongside power cables (for submarines).

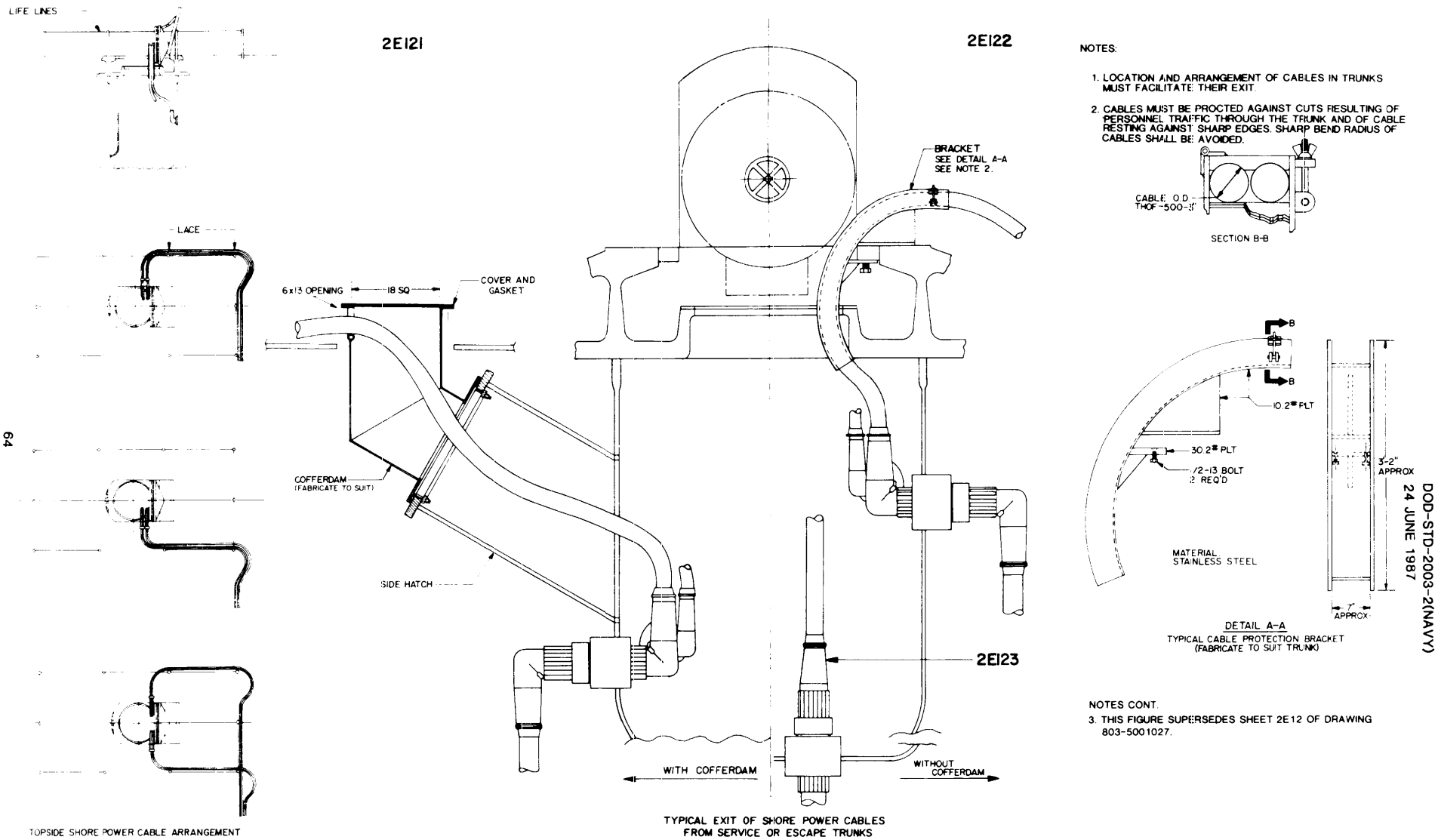
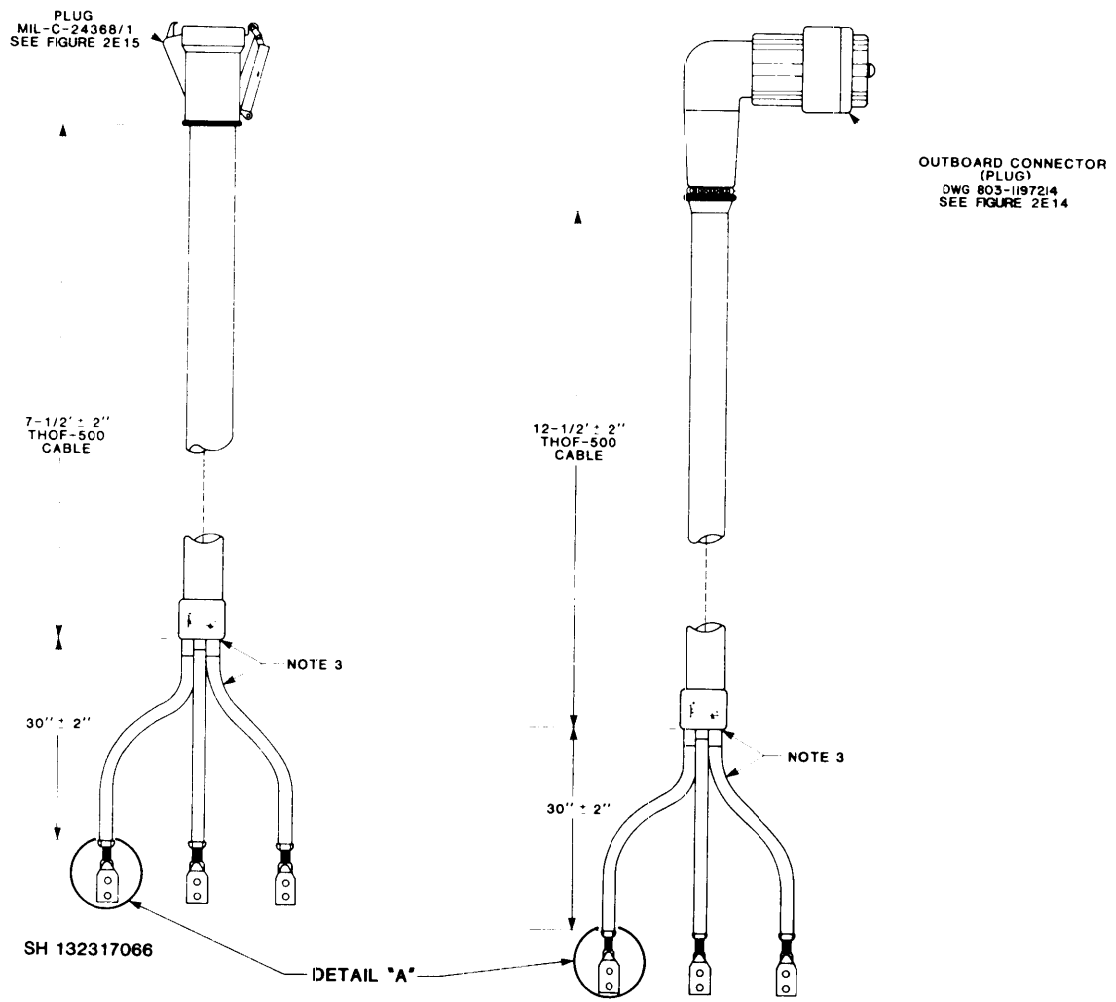
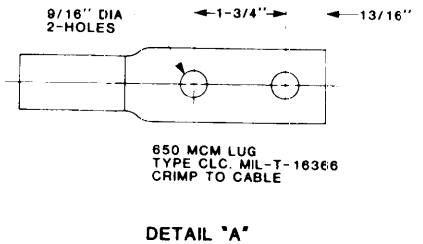


FIGURE 2E12. Protection of shore power cables when exiting trunks (submarines).



NOTES:

1. PORTABLE SHORE POWER JUMPER ASSEMBLIES ARE A NATO REQUIREMENT. THEY ARE FURNISHED ONBOARD SHIPS TO CONNECT TO SHORE CABLE ASSEMBLIES ON FOREIGN PORTS OR IN PLACES WHERE THE PROPER PLUGS ARE NOT AVAILABLE. NORMALLY, THE SUPPLY ACTIVITY PROVIDES BOTH THE CABLE ASSEMBLY AND THE APPROPRIATE PLUGS
2. STOWAGE FACILITIES SHALL BE FURNISHED FOR THESE ASSEMBLIES.
3. INSTALL A CROTH BOOT AND TUBING IN ACCORDANCE WITH FIGURE 2E17
4. THE NATO REQUIRED ADPTER CABLES SHOULD NOT INCLUDE IN-LINE CONNECTORS.
5. THIS FIGURE SUPERSEDES SHEET 2E13 OF DRAWING 803-5001027.



DETAIL "A"

FIGURE 2E13. Portable shore power cable jumper assemblies.

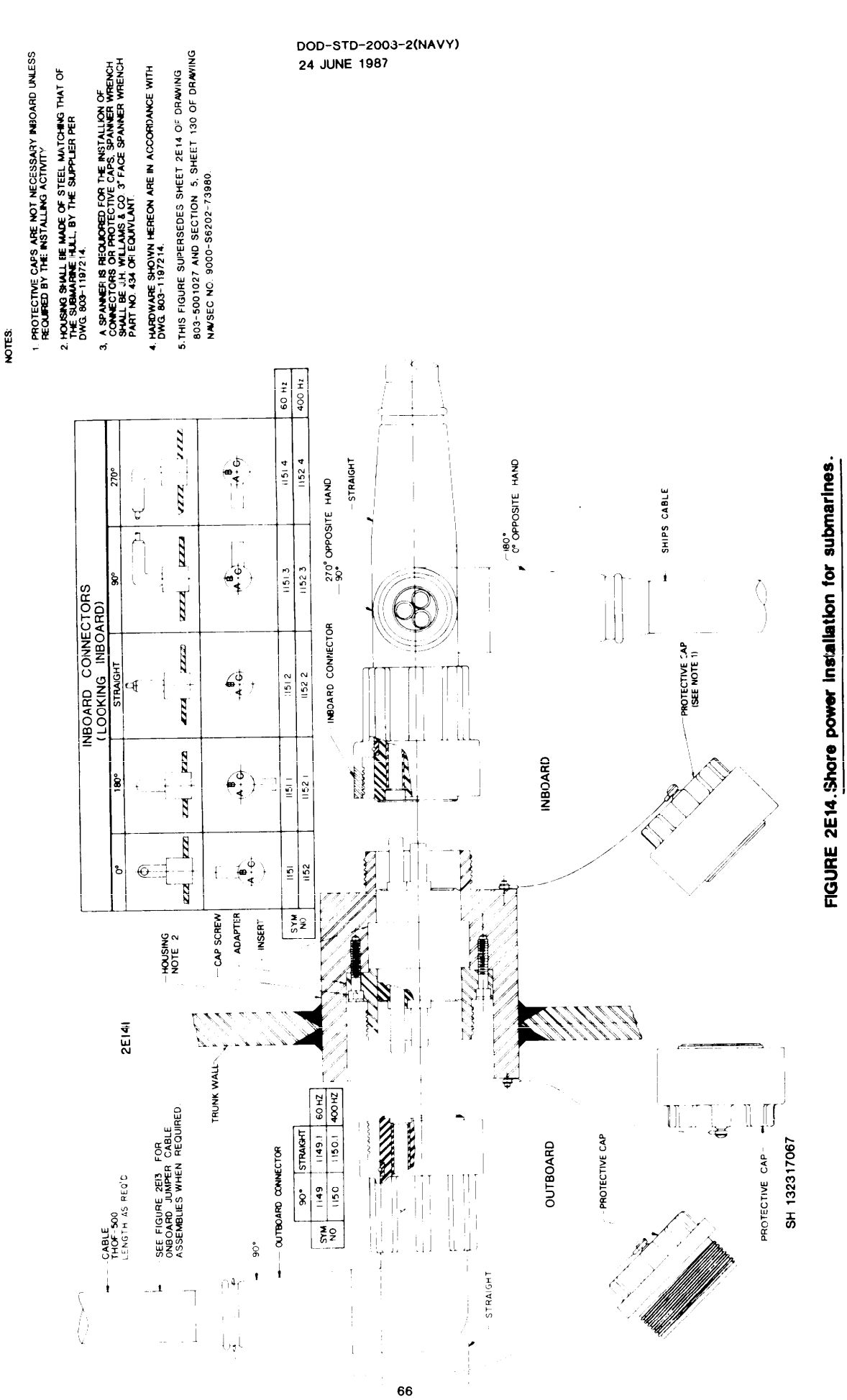


FIGURE 2E14. Shore power installation for submarines.

surrounds the core of an optical fiber and that has a lower index of refraction

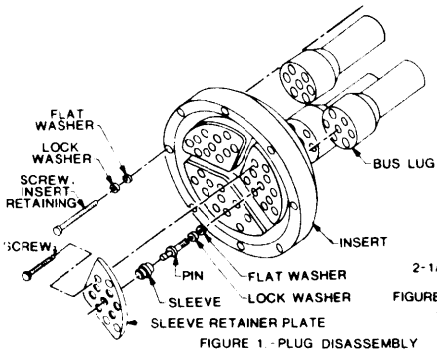


FIGURE 1. - PLUG DISASSEMBLY

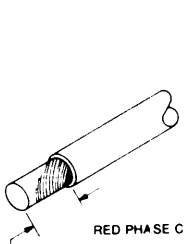


FIGURE 2A. - SINGLE CONDUCTOR CABLE - FOR RECEPTACLE ONLY - SHEET 2E16

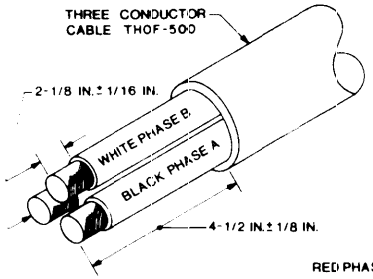


FIGURE 2B. - 3 CONDUCTOR CABLE

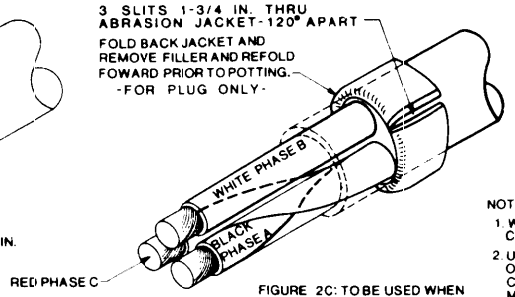


FIGURE 2C: TO BE USED WHEN CABLE LAY IS OUT OF PHASE WITH BUS BAR ORIENTATION. FIG. 3.

FIGURE 2C. - 3 CONDUCTOR CABLE

NOTES:

1. WHEN THE PLUG MIL-C-24368/1 IS FURNISHED WITHOUT CABLE, IT SHALL BE PREPARED FOR USE AS SHOWN HEREON.
2. UNLESS OTHERWISE SPECIFIED IN THE CONTRACT OR ORDER BUS LUGS ARE FURNISHED FOR 500 MCM CABLE CABLE SIZE REDUCERS, PART M24368/4-033, OF MIL-C-24368/4 SHALL BE USED IF 400MCM CABLE IS USED
3. POTTING COMPOUND SHALL BE 100 PARTS BY WEIGHT OF STYCAST 2741 CURED WITH 50 PARTS BY WEIGHT OF CATALYST 15 AS MANUFACTURED BY EMERSON CUMING, INC., CANTON, MASSACHUSETTS 02021. NO OTHER COMPOUND SHALL BE USED WITHOUT PRIOR APPROVAL OF NAVSEA. TO FILL THE PLUG 3/4 OF A GALLON (5 LBS.) IS REQUIRED. NOTE: VERIFY THAT MFR'S. POTTING COMPOUND EXPIRATION DATE IS STILL CURRENT
4. CAUTION - IF SLEEVE CHAMFER IS NOT FACING OUT A HAZARDOUS CONDITION WILL EXIST
5. THIS FIGURE SUPERSEDES SHEET 2E15 OF DRAWING 803-5001027.

STEP 1. PLUG DISASSEMBLY

IF PLUG IS RECEIVED PARTIALLY ASSEMBLED, REMOVE INSERT RETAINING SCREWS AND REMOVE INSERT. BY PUSHING FROM REAR, REMOVE SLEEVE RETAINING PLATES, SLEEVES, PINS AND BUS LUGS.

STEP 2. CABLE END PREPARATION

REMOVE ABRASION JACKET AND INSULATION AS SHOWN IN FIGURE 2A, 2B, OR 2C AS APPLICABLE

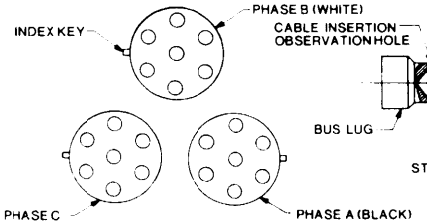


FIGURE 3. - FRONT VIEW BUS LUG AND CABLE CONDUCTOR ORIENTATION

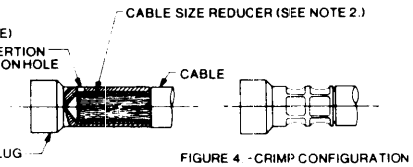


FIGURE 4. - CRIMP CONFIGURATION

STEP 3. CABLE TERMINATION

PRIOR TO CRIMPING, POSITION BUS LUGS ON CONDUCTORS AS SHOWN IN FIGURE 3. NOTE POSITION OF INDEX KEYS. INSERT CABLE INTO BUS LUGS AND CRIMP AS SHOWN IN FIGURE 4. CRIMP USING THOMAS & BETTS (T&B) DIE NO. 94H OR EQUIVALENT.

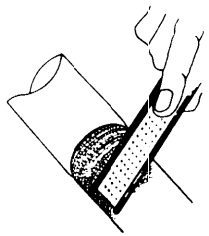


FIGURE 5. - CABLE INSULATION SCRAPING

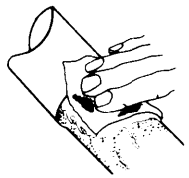


FIGURE 6. - CABLE INSULATION CLEANING

STEP 4. CABLE SCRAPING AND CLEANING

THOROUGHLY SCRAPE AND ROUGHEN THE OUTSIDE INSULATION AT THE CONDUCTORS AND CABLE JACKET WITH A SCRAPER, COARSE FILE OR EMERY CLOTH FOR A LENGTH TO BE POTTED TO INSURE ADHESION WITH THE POTTING COMPOUND. ABRADE THE REAR FACE OF THE INSERT (BUS LUG SIDE) AND THE INSIDE SURFACE OF THE PLUG IN THE SAME MANNER. CLEAN ABRADED AREA WITH A LINT FREE CLOTH WETTED WITH ACETONE OR METHYL ETHYL KETONE. AND ALLOW TO DRY.

NOTE: AVOID TOUCHING OR HANDLING OF ROUGHENED AREA TO ELIMINATE ANY CONTAMINATION OF SURFACE.

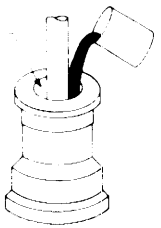


FIGURE 9

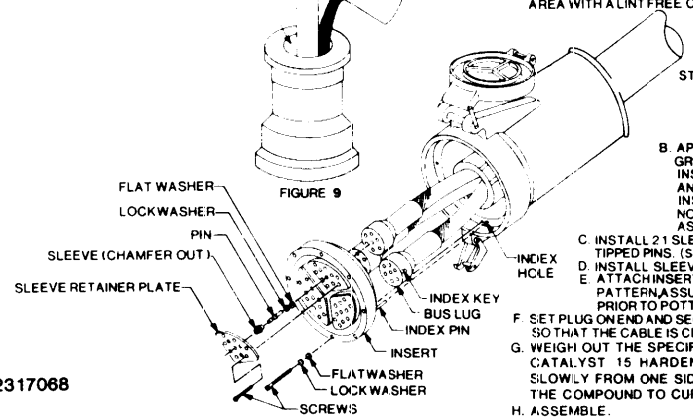


FIGURE 8- PLUG ASSEMBLY

STEP 6. POTTING

SLIDE PLUG HOUSING OVER CABLE AND ASSEMBLE AS FOLLOWS. (SEE FIGURE 8):

A. POSITION INSERT ON THE BUS LUGS SO INDEX KEYS FIT IN THEIR RESPECTIVE SLOTS.
B. APPLY A LIGHT COAT OF NON-INSULATING LUBRICANT (NOT SILICONE GREASE) TO THREADS OF THE 21 PINS AND INSTALL THROUGH THE INSERT, SO LUGS AND INSERT ARE "LOCKED" TOGETHER. LOCKWASHERS AND FLAT WASHERS ARE USED WITH EACH PIN. FLAT WASHERS ARE INSTALLED NEXT TO THE INSERT.
NOTE: DO NOT OVER TIGHTEN PINS (30 INCH-POUNDS MAXIMUM) AS THEY ARE COPPER.
C. INSTALL 21 SLEEVES, CHAMFER FACING OUT, BY SNAPPING THEM ONTO THE BALL TIPPED PINS. (SEE NOTE 4)
D. INSTALL SLEEVE RETAINER PLATES (4 SCREWS EACH).
E. ATTACH INSERT TO PLUG HOUSING WITH EIGHT SCREWS. THE INDEX PIN AND HOLE PATTERN ASSURE PROPER POSITION. ASSURE THAT THE EIGHT SCREWS ARE TIGHT PRIOR TO POTTING.
F. SET PLUG ON END AND SECURE THE CABLE TO A SUITABLE OVERHEAD SUPPORT. POSITION PLUG SO THAT THE CABLE IS CENTERED IN HOLE AT REAR OF THE HOUSING. (FIGURE 9).
G. WEIGH OUT THE SPECIFIED RATIO OF THE STYCAST 2741 POTTING COMPOUND AND THE CATALYST 15 HARDENER & MIX THROUGHLY. (SEE NOTE 3). POUR THE MIXED COMPOUND SLOWLY FROM ONE SIDE OF THE PLUG HOUSING UNTIL THE VOID AREA IS FILLED. ALLOW THE COMPOUND TO CURE EIGHT HOURS AT ROOM TEMPERATURE.
H. ASSEMBLE.

STEP 7. THE PLUG IS NOW READY FOR USE

SH 132317068

FIGURE 2E15. Termination and potting ship-or-shore power plug MIL-C-24368/1.

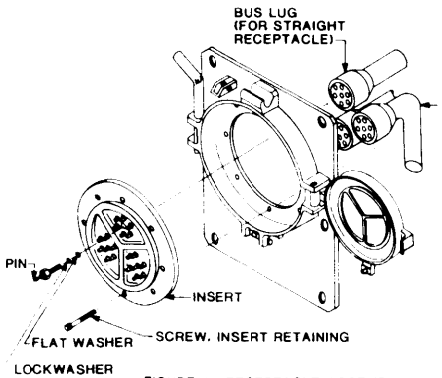


FIGURE 1.- RECEPTACLE ASSEMBLY

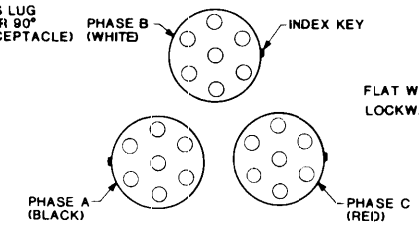


FIGURE 2A.- FRONT VIEW BUS BAR AND CONDUCTOR ORIENTATION

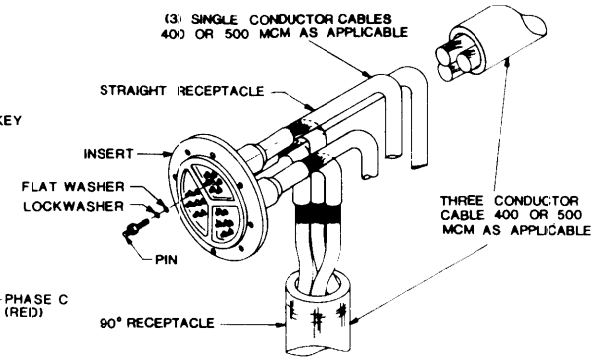


FIGURE 2B.- INSERT AND CABLE ASSEMBLY

NOTES:
1. WHEN THE RECEPTACLE MIL-C-24368/2 IS FURNISHED WITHOUT CABLE, IT SHALL BE PREPARED FOR USE AS SHOWN HEREON.
2. UNLESS OTHERWISE SPECIFIED IN THE CONTRACT OR ORDER, BUS LUGS ARE FURNISHED FOR 400 MCM CABLE
3. POTTING COMPOUND SHALL BE 100 PARTS BY WEIGHT OF STYCAST, 2741 CURED WITH 50 PARTS BY WEIGHT OF CATALYST 15 AS MANUFACTURED BY EMERSON CUMING, INC., CANTON, MASSACHUSETTS 02021. NO OTHER COMPOUND SHALL BE USED WITHOUT PRIOR APPROVAL OF NAVSEA. THE MATERIAL REQUIRED TO FILL THE MOLD IS SHOWN NEXT TO FIGURE 3A.
4. THIS FIGURE SUPERSEDES SHEET 2E16 OF DRAWING 803-5001027.

STEP 1.- IF RECEPTACLE IS RECEIVED PARTIALLY ASSEMBLED, REMOVE INSERT RETAINING SCREWS AND REMOVE INSERT BY PUSHING FROM REAR. IF CRIMPING OF CABLE TO BUS LUGS CANNOT BE DONE WHILE BUS LUGS ARE STILL ASSEMBLED IN THE INSERT, REMOVE THEM BY REMOVING THE PINS.

STEP 2.- PREPARE AND TERMINATE CABLE SAME AS STEPS 2.3 (MOD. AS SHOWN HEREON) AND 4 OF SHEET 2E15, PRIOR TO CRIMPING, POSITION BUS LUGS ON CONDUCTORS AS SHOWN IN FIGURE 2A. NOTE POSITION OF INDEX KEYS. POSITION INSERT ON THE BUS LUGS SO INDEX KEYS FIT IN THEIR RESPECTIVE SLOTS. APPLY A LIGHT COAT OF NON-INSULATING LUBRICANT (NOT SILICONE GREASE) TO THREADS OF THE 21 PINS AND INSTALL, THROUGH THE INSERT, SO LUGS AND INSERT ARE "LOCKED" TOGETHER AS SHOWN IN FIGURE 2B. IF CABLE IS LONG OR INSTALLED IN SHIP SLIDE MOUNTING PLATE OVER CABLE FIRST

NOTE: DO NOT OVER TIGHTEN PINS (30 INCH-POUNDS MAXIMUM) AS THEY ARE COPPER.

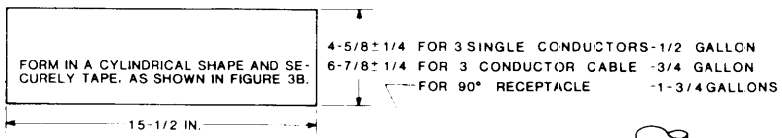


FIGURE 3A

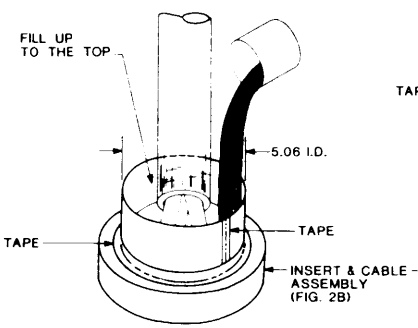


FIGURE 3B

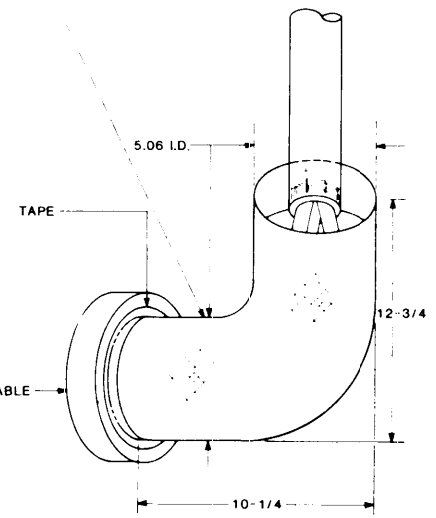


FIGURE 3.- MOLD FOR STRAIGHT RECEPTACLE

SH 132317069

FIGURE 4.- MOLD FOR 90° RECEPTACLE

STEP 3.-POTTING:

A. FABRICATE A MOLD TO THE DIMENSIONS SHOWN IN FIGURES 3 AND 4 FROM A MATERIAL SUCH AS .03 THICK PLASTIC SHEET, A CELLULOSE ACETATE MATERIAL HAS BEEN SHOWN TO BE SATISFACTORY. CENTER & SECURE MOLD TO INSERT WITH TAPE.
B. POSITION INSERT AND SECURE CABLE TO A SUITABLE OVERHEAD SUPPORT. CENTER CABLE IN MOLD.
C. WEIGH OUT THE SPECIFIED RATIO OF THE STYCAST 2741 POTTING COMPOUND AND THE CATALYST 15 HARDENER AND MIX THROUGHLY. (SEE NOTE 3). POUR THE MIXED COMPOUND SLOWLY FROM ONE SIDE OF THE RECEPTACLE HOUSING UNTIL THE VOID AREA IS FILLED. ALLOW THE COMPOUND TO CURE EIGHT HOURS AT ROOM TEMPERATURE.
D. REMOVE TAPE HOLDING MOLD TO INSERT. THE MOLD MAY BE REMOVED IF DESIRED.
E. SLIDE CABLE THROUGH THE HOLE, SEE FIGURE 5. IN THE RECEPTACLE MOUNTING PLATE AND ATTACH INSERT WITH EIGHT SCREWS AND NUTS. THE INDEX PIN AND HOLE PATTERN WILL ASSURE PROPER POSITION.

STEP 4.- THE RECEPTACLE IS NOW READY FOR USE.

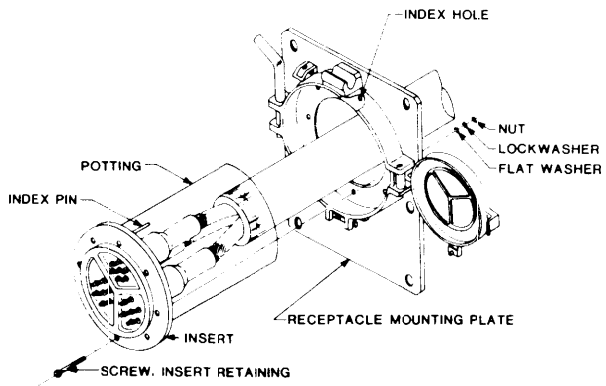


FIGURE 5.- RECEPTACLE ASSEMBLY

FIGURE 2E16. Termination and potting ship-or-shore power receptacle MIL-C-24368/2.

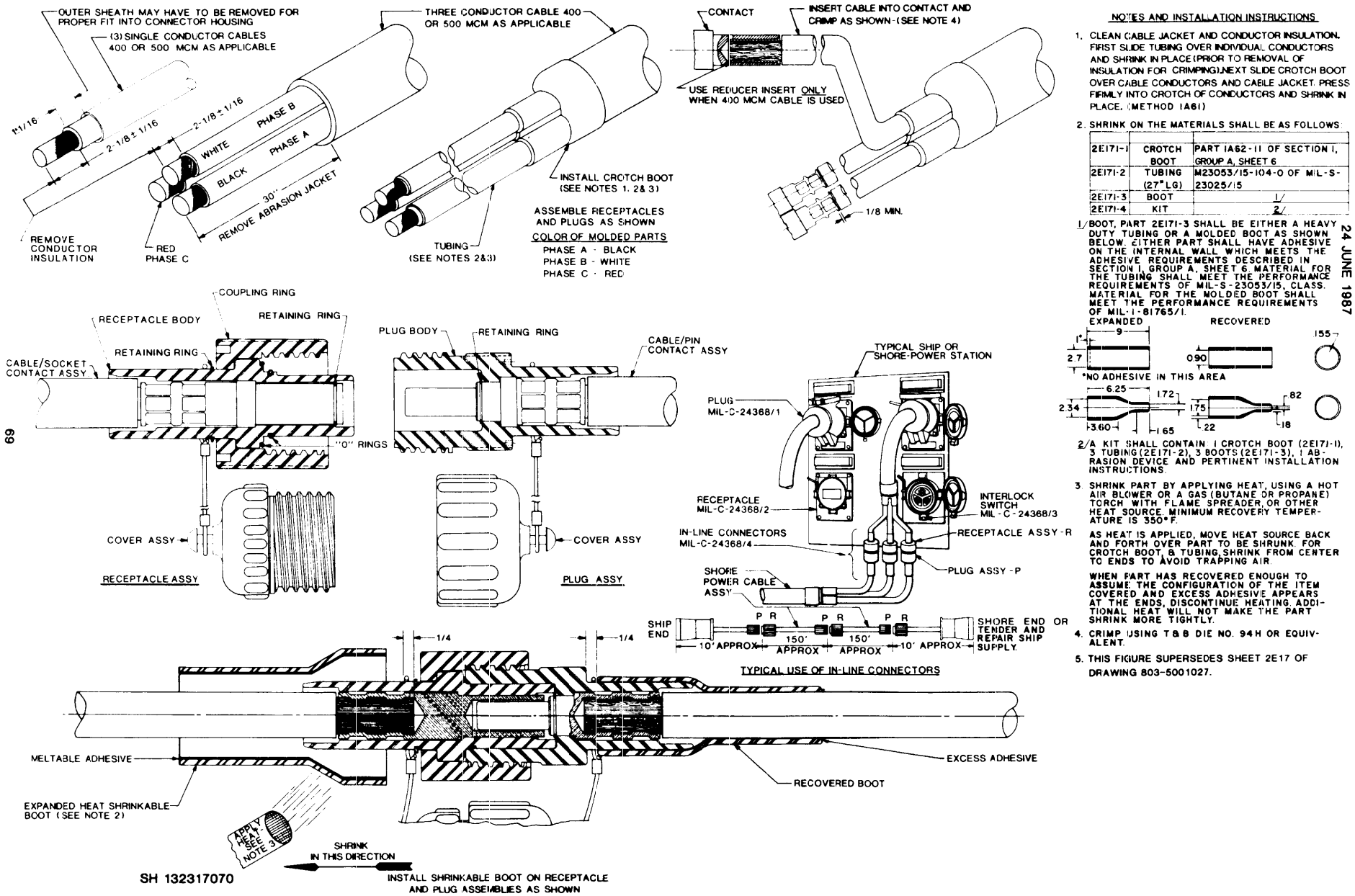


FIGURE 2E17. Ship-or-shore power in-line connectors MIL-C-24368/4.

NOTES AND INSTALLATION INSTRUCTIONS

1. CLEAN CABLE JACKET AND CONDUCTOR INSULATION. FIRST SLIDE TUBING OVER INDIVIDUAL CONDUCTORS AND SHRINK IN PLACE (PRIOR TO REMOVAL OF INSULATION FOR CRIMPING). NEXT SLIDE CROTCH BOOT OVER CABLE CONDUCTORS AND CABLE JACKET. PRESS FIRMLY INTO CROTCH OF CONDUCTORS AND SHRINK IN PLACE. (METHOD 1A61)

2. SHRINK ON THE MATERIALS SHALL BE AS FOLLOWS:

2E171-1	CROTCH BOOT	PART 1A62-11 OF SECTION I, GROUP A, SHEET 6
2E171-2	TUBING (27" LG)	M23053/15-104-0 OF MIL-S-23025/15
2E171-3	BOOT	1/
2E171-4	KIT	2/

1/ BOOT, PART 2E171-3 SHALL BE EITHER A HEAVY DUTY TUBING OR A MOLDED BOOT AS SHOWN BELOW. EITHER PART SHALL HAVE ADHESIVE ON THE INTERNAL WALL WHICH MEETS THE ADHESIVE REQUIREMENTS DESCRIBED IN SECTION I, GROUP A, SHEET 6. MATERIAL FOR THE TUBING SHALL MEET THE PERFORMANCE REQUIREMENTS OF MIL-S-23053/15, CLASS. MATERIAL FOR THE MOLDED BOOT SHALL MEET THE PERFORMANCE REQUIREMENTS OF MIL-I-81765/1.

2/ A KIT SHALL CONTAIN 1 CROTCH BOOT (2E171-1), 3 TUBING (2E171-2), 3 BOOTS (2E171-3), 1 ABRASION DEVICE AND PERTINENT INSTALLATION INSTRUCTIONS.

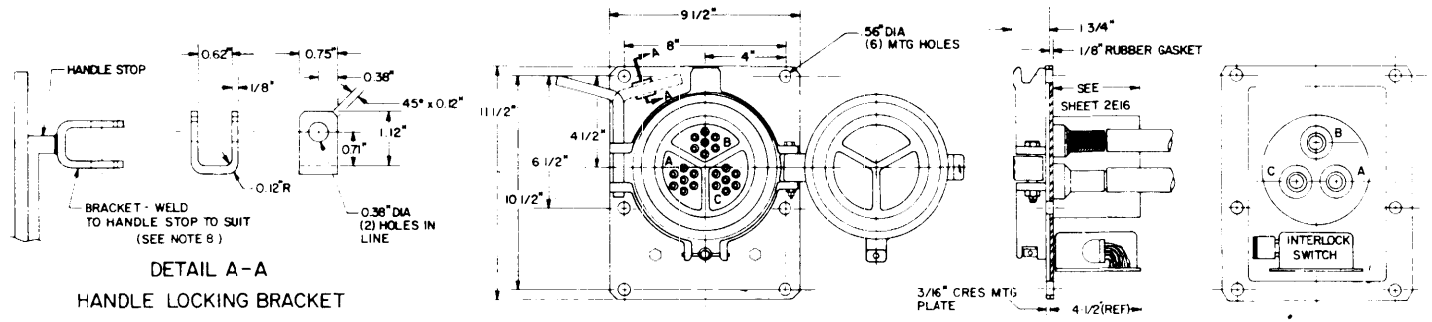
3. SHRINK PART BY APPLYING HEAT, USING A HOT AIR BLOWER OR A GAS (BUTANE OR PROPANE) TORCH WITH FLAME SPREADER, OR OTHER HEAT SOURCE. MINIMUM RECOVERY TEMPERATURE IS 350°F.

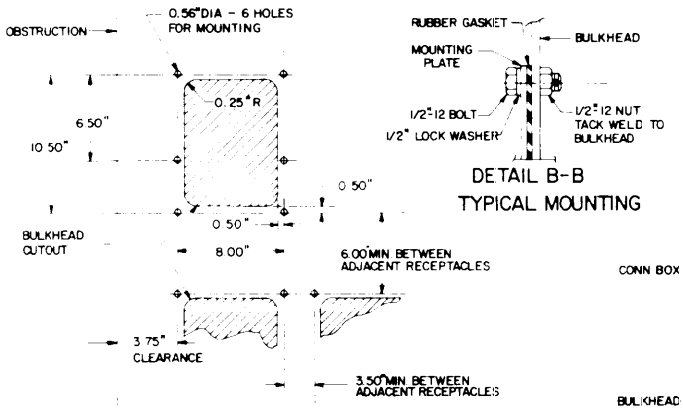
   AS HEAT IS APPLIED, MOVE HEAT SOURCE BACK AND FORTH OVER PART TO BE SHRUNK. FOR CROTCH BOOT, & TUBING, SHRINK FROM CENTER TO ENDS TO AVOID TRAPPING AIR.

   WHEN PART HAS RECOVERED ENOUGH TO ASSUME THE CONFIGURATION OF THE ITEM COVERED AND EXCESS ADHESIVE APPEARS AT THE ENDS, DISCONTINUE HEATING. ADDITIONAL HEAT WILL NOT MAKE THE PART SHRINK MORE TIGHTLY.

4. CRIMP USING T&B DIE NO. 94H OR EQUIVALENT.

5. THIS FIGURE SUPERSEDES SHEET 2E17 OF DRAWING 803-5001027.

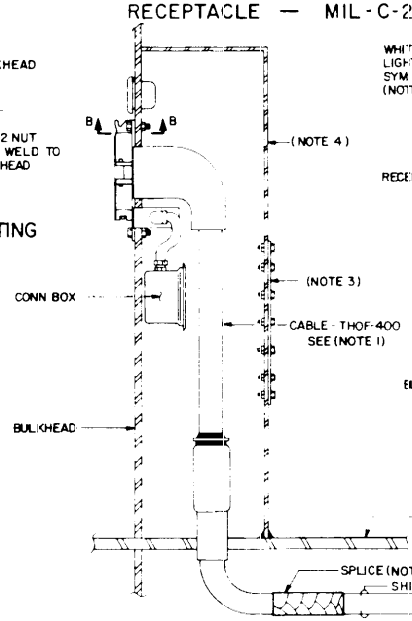




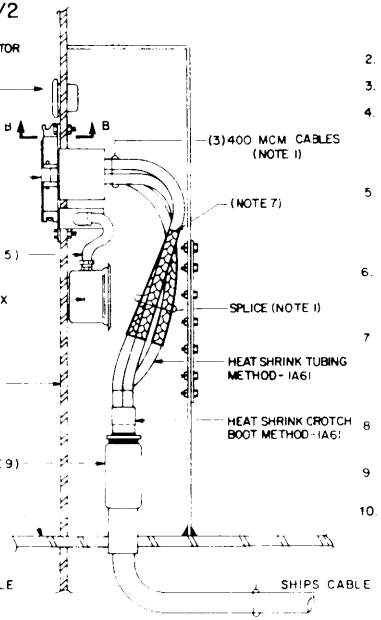
CUTOUT, MOUNTING DIMENSIONS & CLEARANCES

DETAIL B-B
TYPICAL MOUNTING

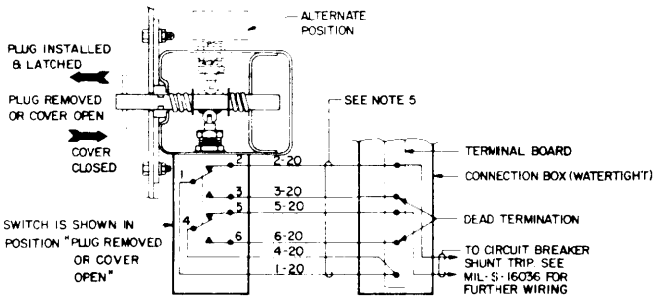
RECEPTACLE — MIL-C-24368/2

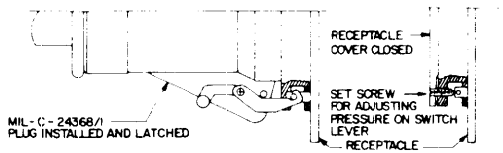


TYPICAL BELOW DECK SPLICE



TYPICAL ABOVE DECK SPLICE



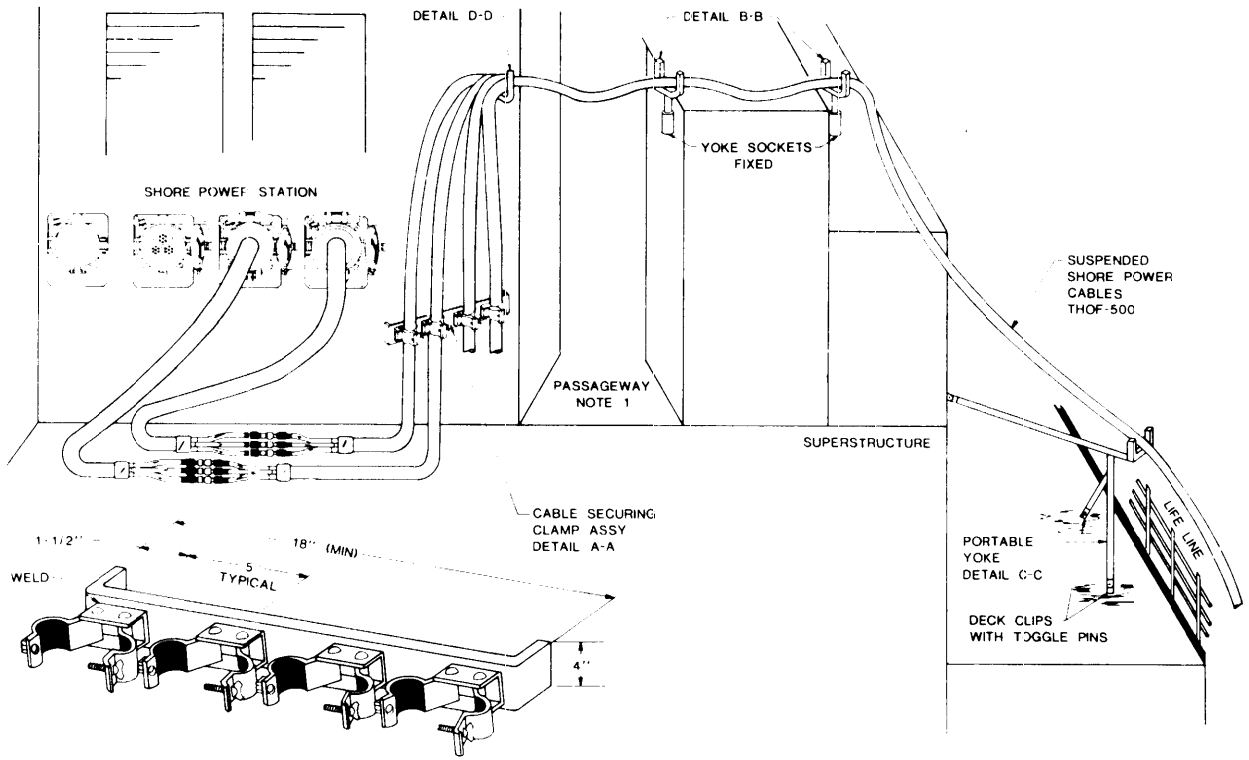


WIRING DIAGRAM AND OPERATION OF RECEPTACLE INTERLOCK SWITCH (SEE NOTE 6)
SH 132317071

NOTES:

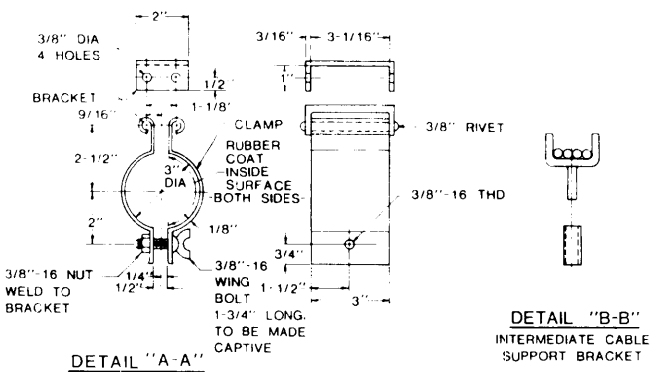
1. WHERE RECEPTACLES ARE POTTED BY A MANUFACTURER TO A SHORT LENGTH OF CABLE, SPLICE SHALL BE PER SECTION I, GROUP E. FOR GREATER ACCESSIBILITY, SPLICE MAY BE LOCATED BELOW DECK. SHIP'S CABLE MAY BE TERMINATED AND POTTED DIRECTLY ONTO THE RECEPTACLE AS SHOWN ON SHEET 2E16 BY THE INSTALLING ACTIVITY.
2. FOR SUITABLE CABLE SUPPORT, SEE MIL-STD-XXX-4
3. ACCESS TO TERMINAL BOXES AND RECEPTACLES SHALL BE PROVIDED.
4. PROTECTIVE ENCLOSURE IS REQUIRED TO PROVIDE PROTECTION AND PERSONNEL SAFETY AND SHALL BE OF A TIGHTNESS REQUIRED PER COMPARTMENT LOCATION. PROPER GASKETING AND DRAINAGE FOR CONDENSATION SHALL BE PROVIDED FOR WATERTIGHT ENCLOSURES.
5. SIX NO. 20 AWG WIRE LEADS, 36 INCHES LONG ARE PROVIDED WITH EACH SWITCH MARKED WITH CIRCUIT IDENTIFICATION AND WIRE SIZE (1-20, 2-20, ETC). A HEAT SHRINKABLE TUBING (PER MIL-I-23053/4 CLASS 2) SHALL BE INSTALLED OVER THE WIRE LEADS BETWEEN THE SWITCH AND CONNECTION BOX.
6. OPENING OF COVER OR UNLATCHING OF PLUG ACTIVATES THE SHUNT TRIP OF CIRCUIT BREAKER, OPENING THE BREAKER TO "TRIP" POSITION. COVER MUST BE CLOSED OR PLUG LATCHED BEFORE CIRCUIT BREAKER CAN BE CLOSED.
7. SEE MIL-S-16036 FOR WIRING OF THE INDICATOR LIGHTS. THE ALTERNATE CONNECTION OF THE INDICATOR LIGHTS AS SHOWN IN MIL-S-16036 CAN BE MADE WHEN CRIMPING THE CONDUCTORS AT THE CABLE SPLICE. FLUSH MOUNTING OF INDICATOR LIGHTS IS PREFERED FOR GREATER PROTECTION (SEE DETAIL "A", FIGURE 2E9
8. A HANDLE LOCKING BRACKET SHALL BE INSTALLED WHEN RECEPTACLES ARE FURNISHED WITHOUT BRACKETS.
9. DECK OR BULKHEAD CABLE PENETRATIONS SHALL BE PER MIL-STD-XXX-3
10. THIS FIGURE SUPERSEDES SHEET 2E18 OF DRAWING 803-5001027.

FIGURE 2E18. Installation details for shore power receptacle MIL-C-24368/2.



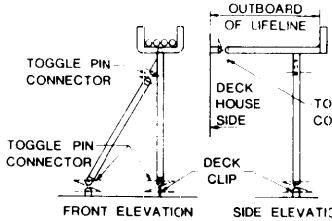
NOTES:

1. THE LOCATION OF THE SHORE POWER STATION SHALL BE DETERMINED WITH RESPECT TO THE LAY OF THE PORTABLE SHORE POWER CABLES OVER THE SHIP, WITH DUE CONSIDERATION GIVEN TO SECURING OF CABLES AWAY FROM PERSONNEL TRAFFIC ON DECK.
2. SURFACE OF CABLE CONTACT TO BRACKETS SHALL BE SMOOTH TO MINIMIZE CABLE DAMAGE.
3. A CABLE SECURING CLAMP ASSEMBLY (IES) SHALL BE INSTALLED ON A SUITABLE LOCATION TO PROVIDE CABLE STRAIN RELIEF ON THE PLUGS.
4. THIS FIGURE SUPERSEDES SHEET 2E19 OF DRAWING 803-5001027.

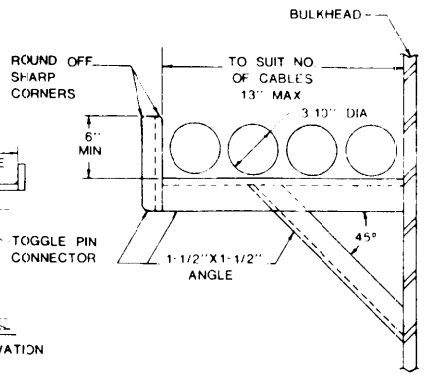


DETAIL "A-A"
CABLE SECURING CLAMP ASSEMBLY

DETAIL "B-B"
INTERMEDIATE CABLE SUPPORT BRACKET



DETAIL "C-C"
PORTABLE YOKE



DETAIL "D-D"
BULKHEAD CABLE SUPPORT BRACKET

SH 132317072

FIGURE 2E19. Typical shore power cable supports.

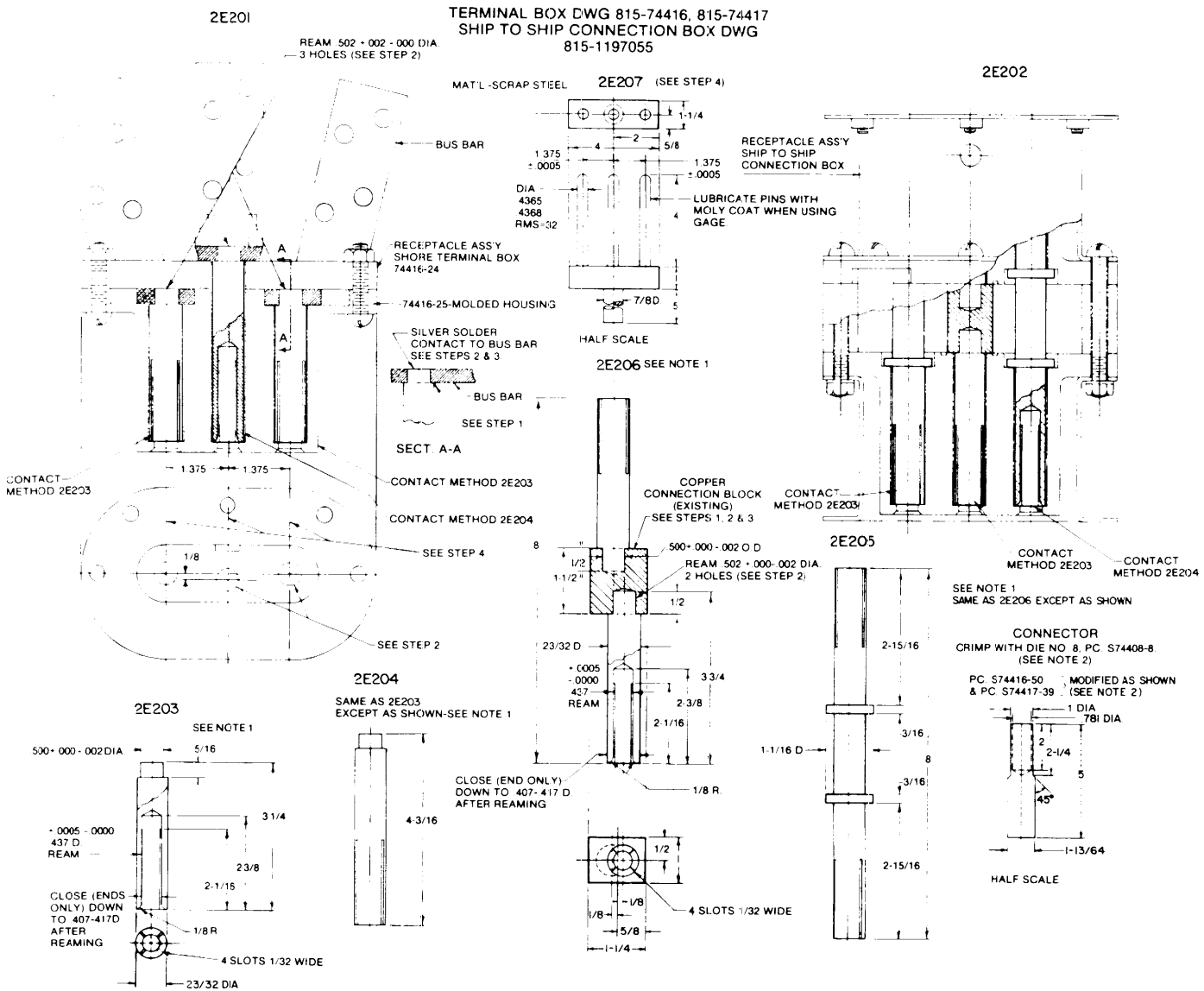


FIGURE 2E20. Repair of shore power terminal boxes.

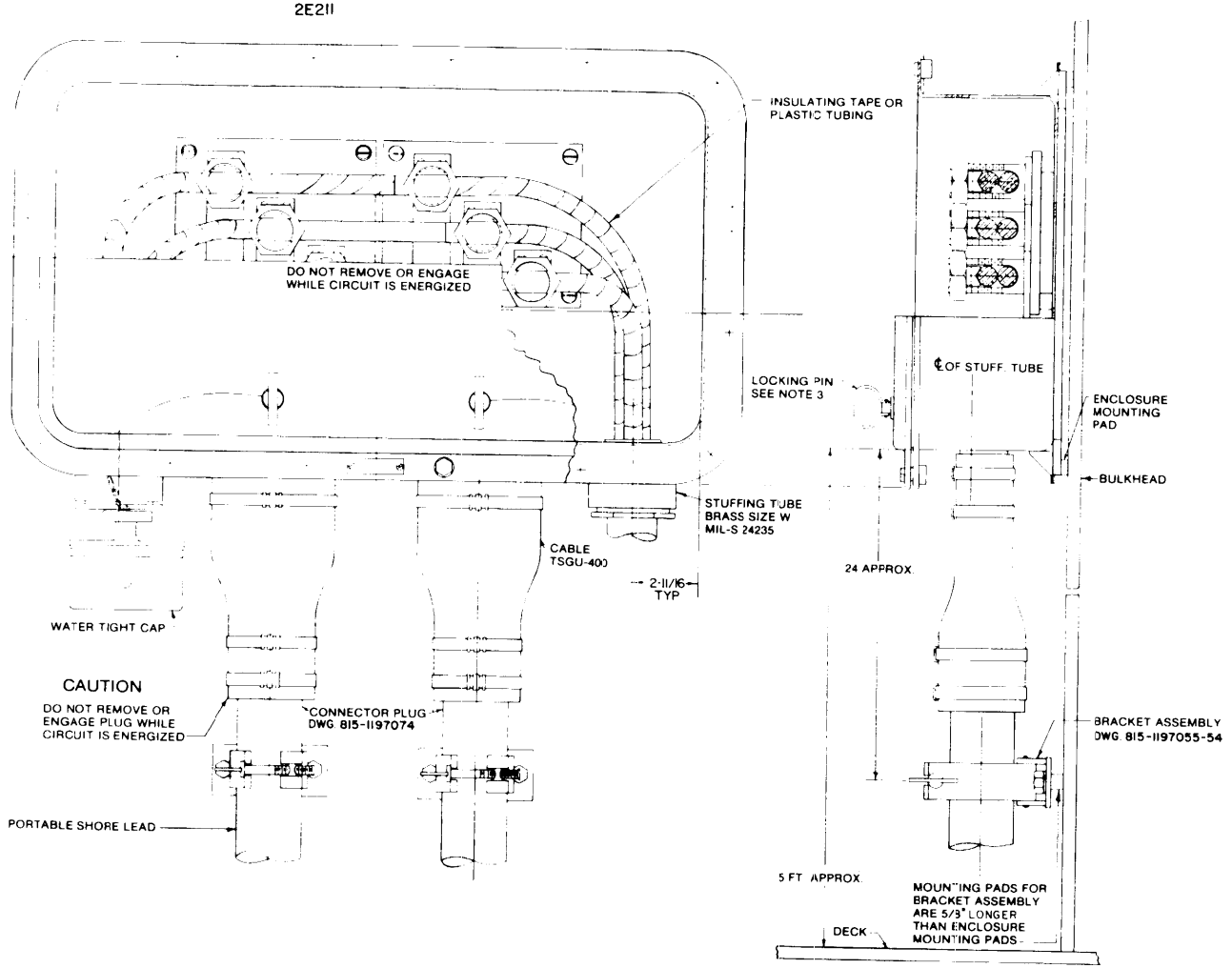
NOTES:

1. MATERIAL FOR RECEPTACLE CONTACTS SHALL BE BERRYLLIUM-COPPER SPECIFICATION MIL-C-46087, TEMPER HT. CONTACTS SHALL BE COMPLETELY SILVER PLATED .005 THICK.
2. IN CONNECTING PERMANENT CABLE TO SHORE TERMINAL BOXES, USE CONNECTOR PER DETAIL HEREON IN LIEU OF PIECES S74416-5 AND S74417-39. THIS THINNER WALL IS NECESSARY FOR SATISFACTORY HEXAGONAL CRIMP WITH PERCUSSION CRIMPING TOOL.
   BU. DRAWING 9000-S6202-74408 WITH DIE NO 8.
3. THIS FIGURE SUPERSEDES SHEET 2E20 OF DRAWING 803-5001027 AND SECTION 4, SHEET 139 OF DRAWING. NAVSEC NO. 9000-S6202-73980.

INSTRUCTIONS FOR REPLACING RECEPTACLE CONTACTS

1. REMOVE EXISTING CONTACTS FROM ITS ASSOCIATED BUS BAR BY CUTTING FLUSH WITH BUS BAR SURFACE. SPOT FACE BUS AS REQUIRED AS TO INSURE PROPER SHOULDERING OF REPLACEMENT CONTACTS STEP
2. DRILL AND REAM TO ALLOW CLEARANCE FOR .001 TO .003 THICKNESS OF SILVER SOLDER. CARE SHALL BE TAKEN TO INSURE PROPER ALIGNMENT OF CONTACTS. THIS MAY BE ACCOMPLISHED AS FOLLOWS:
   (A) USE OF A JIG.
   (B) REASSEMBLY OF BUS BARS IN RECEPRECEPTACLE HOUSING AND TEMPLATE THROUGH CONTACT OPENINGS.
3. SILVER SOLDER CONTACTS IN BUS BARS, CARE SHALL BE TAKEN TO INSURE THAT CONTACTS ARE PROPERLY SEATED. THE CONTACTS SHALL BE PROTECTED TO PREVENT SOFTENING OF THE CONTACT DURING SILVER SOLDERING SUCH AS BY IMMERSION IN WATER TO WITHIN ONE INCH OF SOLDER
4. REASSEMBLE RECEPTACLE ASSEMBLY "GO" GAGE PC 2E207 SHALL BE USED TO VERIFY THE AXIAL ALIGNMENT OF RECEPTACLE CONTACTS.

NOT FOR NEW CONSTRUCTION
(REPAIR ONLY)



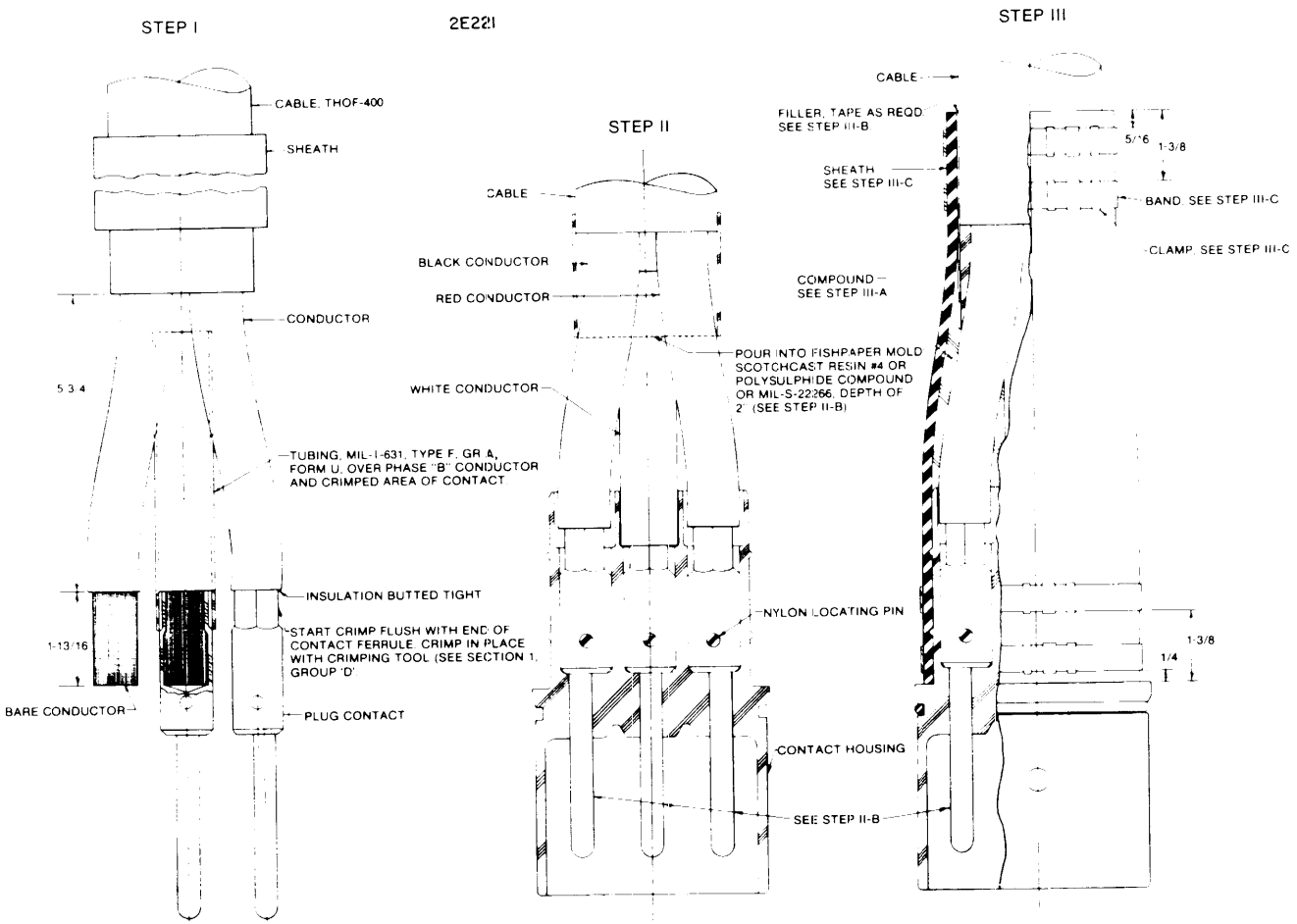
SH 132317074

FIGURE 2E21. Mounting shore power terminal box.

NOTES:

1. CABLE BRACKETS Pc. 1197055-54 SHALL BE INSTALLED AS SHOWN ON DETAIL.
2. TAPE INDIVIDUAL CONDUCTORS FROM TERMINAL LUGS TO STUFFING TUBE AND BETWEEN TERMINALS.
3. INSERT PLUG UNTIL LOCKING PIN ENGAGES WITH HOLE IN PLUG
4. TERMINAL BOX SHOWN HEREON IS FOR USE WITH THE FOLLOWING CABLE ASSEMBLIES:
   DWG. 815-1197056
   DWG. 815-1197074
   INSTALLATION AND REPAIR OF ABOVE COMPONENTS IS SHOWN ON SHEET 8 AND 9.
5. REPAIR OF SHORE TERMINAL BOXES IS SHOWN ON SHEET 6.
6. AN INSULATING BACKING PLATE SHALL BE INSTALLED ON SHORE TERMINAL BOXES THAT ARE LOCATED ADJACENT TO VITAL EQUIPMENT WHICH COULD BE DAMAGED IN THE EVENT OF AN ELECTRICAL BOX FIRE AND WHERE IT IS NOT PRACTICAL TO RELOCATE THE BOX. THE BACKING PLATE SHALL BE MADE OF 1" THICK MELAMINE RESIN, CONFORMING TO MIL-P-15037, CLASS B, AND BE OF A SIZE TO PROTECT THE ENTIRE BACK AREA OF THE SHORE TERMINAL BOX.
7. THIS FIGURE SUPERSEDES SHEET 2E21 OF DRAWING 803-5001027 AND ACTION SECTION 4 SHEET 143 OF DRAWING NAVSEA 9000-S6202-73980

NOT FOR NEW CONSTRUCTION
(REPAIR ONLY)



SH 132317075

FIGURE 2E22. Repairing shore power cables.

NOTES:

1. CABLE ASSEMBLIES SHOWN HEREON ARE FOR USE WITH THE FOLLOWING SHORE TERMINAL AND OR CONNECTION BOXES:
   - DWG 815-74416
   - " 815-74417
   - " 815-1197055
   - " 815-1197071
   - " 815-1197214
   - " 815-1197217

2. CONNECTOR REPAIR KIT FOR USE WITH MAKING UP CABLE ENDS IS SHOWN ON DWG 9000-S6202-74408 AND DESCRIBED IN GROUP D OF SECTION 1.

STEP I

A. SLIDE THE SHEATH HOSE ON THE CABLE.

B. REMOVE OUTER CABLE COVERING (IMPERVIOUS SHEATH).

C. SHAPE FANNED OUT CONDUCTORS TO SUIT THE PLUG AND COLOR CODE. THE ENDS OF CONDUCTORS SHALL THEN BE CUT IN A STRAIGHT LINE FOR INSERTION IN THE CONTACTS.

D. REMOVE INSULATION FROM THE CONDUCTORS AS SHOWN ON DETAIL. CARE SHALL BE TAKEN TO PREVENT CUTTING THE STRANDS WHEN REMOVING INSULATION.

E. INSTALL INSULATING TUBING ON CONDUCTOR AS INDICATED.

F. INSERT THE PREPARED ENDS OF THE CONDUCTORS IN THE PLUG CONTACTS. CARE SHALL BE TAKEN TO INSURE THAT ALL THE STRANDS ARE IN PLACE WITHIN THE CONTACT CAVITY AND THAT OFFSET CONTACTS ARE PROPERLY ALIGNED.

G. CRIMP CONTACTS (SEE DETAIL) WITH PERCUSSION CRIMPING TOOL AND ASSOCIATED DIE, BUSHIPS DWG. 9000-S6202-74408 AS SHOWN IN GROUP 'D' OF SECTION 1. THE HEXAGONAL CRIMP WHEN PROPERLY DONE SHOULD COMPRESS THE FERRULE AND CONDUCTOR INTO A SOLID COPPER ROD.

H. REMOVE ALL COPPER CRIMPING FLASH AND ANY STRAY STRANDS OF THE CONDUCTOR.

STEP II

A. FOR FILLING OF VOID AREA WITH SCOTCH CAST RESIN AND FIBER GLASS. SEE STEP 7 IN GROUP 'D' SECTION 1.

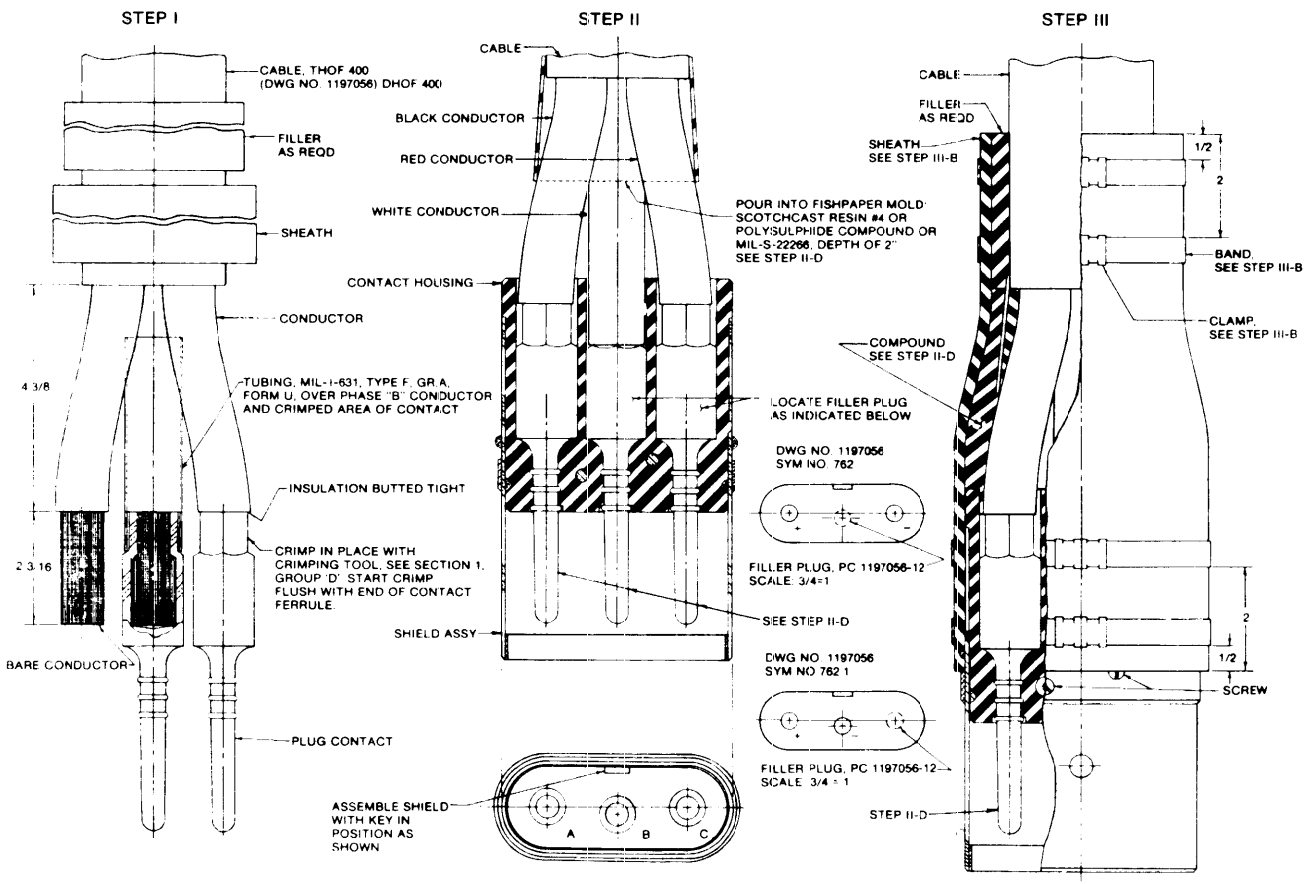
B. APPLY FILLER (TAPE) TO CABLE AS REQUIRED.

C. SLIDE SHEATH IN POSITION INDICATED AND SECURE IN PLACE WITH BANDING.

3. THIS FIGURE SUPERSEDES SHEET 2E22 OF DRAWING 803-5001027 AND SECTION 4, SHEET 142, OF DRAWING, NAVSEC NO. 9000-S6202-73980.

NOT FOR NEW CONSTRUCTION
(REPAIR ONLY)

2E23I



SH 132317076

FIGURE 2E23. Repairing shore power cables.

NOTES:

1. CABLE ASSEMBLIES SHOWN HEREON ARE FOR USE WITH THE FOLLOWING SHORE TERMINAL AND/OR CONNECTION BOXES:
   - DWG. 815-74416
   - " "-74417
   - " "-1197055
   - " "-1197071
   - " "-1197214 & 1197217

2. CONNECTOR REPAIR KIT FOR USE WITH MAKING UP CABLE ENDS IS SHOWN ON DWG 9000-6202-74408 & DESCRIBED IN GROUP 'D', SECTION 1.

STEP I

A. SLIDE THE FILLER HOSE AND SHEATH HOSE ON THE CABLE.
B. REMOVE OUTER CABLE COVERING (IMPERVIOUS SHEATH)
C. SHAPE FANNED OUT CONDUCTORS TO SUIT THE PLUG AND COLOR CODE. THE ENDS OF CONDUCTORS SHALL THEN BE CUT IN A STRAIGHT LINE FOR INSERTION IN THE CONTACTS.
D. REMOVE INSULATION FROM THE CONDUCTORS AS SHOWN ON DETAIL. CARE SHALL BE TAKEN TO PREVENT CUTTING THE STRANDS WHEN REMOVING INSULATION.
E. INSTALL INSULATING TUBING ON CONDUCTOR AS INDICATED.
F. INSERT THE PREPARED ENDS OF THE CONDUCTORS IN THE PLUG CONTACTS. CARE SHALL BE TAKEN TO INSURE THAT ALL THE STRANDS ARE IN PLACE WITHIN THE CONTACT CAVITY.
G. CRIMP CONTACTS (SEE DETAIL) WITH PERCUSSION CRIMPING TOOL AND ASSOCIATED DIE, DWG 9000-S6202-74408 AS SHOWN IN GROUP 'D', SECTION 1.
H. REMOVE ALL COPPER CRIMPING FLASH AND ANY STRAY STRANDS OF THE CONDUCTOR.

STEP II

A. INSERT PLUG CONTACTS IN CONTACT HOUSING TO THE REQUIRED DEPTH.
B. SLIDE SHIELD ASSEMBLY IN PLACE ON THE CONTACT HOUSING. CARE SHALL BE TAKEN TO ALIGN POLARITY KEY ON THE SHIELD WITH CONTACTS AS INDICATED ON DETAIL.
C. SECURE SHIELD IN PLACE WITH FLAT HEAD SCREWS AS INDICATED.
D. CONTACTS SHALL BE HELD IN ALIGNMENT DURING ALL FILLING AND/OR POTTING OPERATIONS WITH A GAGE SIMILAR TO PC. 14 ON DWG. 815-1197074.

STEP III

A. FOR FILLING OF VOID AREA WITH SCOTCH CAST RESIN AND FIBER GLASS, SEE STEP 7 IN GROUP 'D', SECTION 1.
B. SLIDE SHEATH IN POSITION INDICATED AND SECURE IN PLACE WITH BANDING.

3. THIS FIGURE SUPERSEDES SHEET 2E23 OF DRAWING 803-5001027 AND SECTION 4, SHEET 136, OF DRAWING, NAVSEC NO. 9000-S6202-73980.

INSTRUCTIONS: In a continuing effort to make our standardization documents better, the DoD provides this form for use in submitting comments and suggestions for improvements. All users of military standardization documents are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge *(DO NOT STAPLE)*, and mailed. In block 5, be as specific as possible about particular problem areas such as wording which required interpretation, was too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems. Enter in block 6 any remarks not related to a specific paragraph of the document. If block 7 is filled out, an acknowledgement will be mailed to you within 30 days to let you know that your comments were received and are being considered.

NOTE: This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document*(s)* or to amend contractual requirements.

(Fold along this line)

(Fold along this line)

DEPARTMENT OF THE NAVY

COMMANDER
NAVAL SEA SYSTEMS COMMAND (SEA 5523)
DEPARTMENT OF THE NAVY
WASHINGTON, DC 20362-5101

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE $300

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 12503 WASHINGTON D. C.

POSTAGE WILL BE PAID BY THE DEPARTMENT OF THE NAVY

COMMANDER
NAVAL SEA SYSTEMS COMMAND (SEA 5523)
DEPARTMENT OF THE NAVY
WASHINGTON, DC 20362-5101

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions – Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE
DOD-STD-2003-2(NAVY)	ELECTRIC PLANT INSTALLATION STANDARD METHODS FOR SURFACE SHIPS AND SUBMARINES (EQUIPMENT) SECTION 2 OF 5

3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION *(Mark one)*
	☐ VENDOR
b. ADDRESS *(Street, City, State, ZIP Code)*	☐ USER
	☐ MANUFACTURER
	☐ OTHER *(Specify)*:

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional	b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional
c. MAILING ADDRESS *(Street, City, State, ZIP Code)* – Optional	8. DATE OF SUBMISSION *(YYMMDD)*

DD FORM 82 MAR 1426

PREVIOUS EDITION IS OBSOLETE.