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DOD-STD-2003-4(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
(CABLEWAYS)

SECTION 4 OF 5 SECTIONS



AMSC N/A

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24 June 1987

SECTION 4

CABLEWAYS

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 5523, Department of the Navy, Washington, DC 20362-5101 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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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) 5523 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 from Commanding Officer, Portsmouth Naval Shipyard, Code 202.2, Portsmouth, NH 03801. All revisions on microfilm aperture cards, or on microfiche are automatically distributed to a previously approved distribution list. (Tel: (207) 439-1000, Ext. 1718, Autovon 684-1718). Activities having a requirement to be placed on the distribution or for additional copies should forward these requests to Commander, Naval Sea Systems Command, SEA 5523, Department of the Navy, Washington, DC 20362-5101. Aperture cards have been distributed to those activities presently on the distribution for NAVSEA Standard and Type Drawing microfilm aperture card sets. Microfiche has been distributed to all active ships.

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1. SCOPE

1.1 Purpose. The purpose of DOD-STD-2003-4(NAVY) is to disseminate up-to-date information for cableways on surface ships and submarines.

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 Specifications and standards. Unless otherwise specified, the following specifications 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.

SPECIFICATIONS

MILITARY

- | | |
|-------------|--|
| MIL-S-901 | - Shock Tests, H.I. (High-Impact); Shipboard Machinery, Equipment and Systems, Requirements for. |
| MIL-C-915 | - Cable and Cord, Electrical, for Shipboard Use, General Specification for. |
| MIL-I-3064 | - Insulation, Electrical, Plastic-Sealer. |
| MIL-T-16366 | - Terminals, Electrical Lug and Conductor Splices, Crimp Style. |
| MIL-S-24149 | - Studs, Arc Welding, and Arc Shields (Ferrules), General Specification for. |
| MIL-C-24640 | - Cable, Electrical, Lightweight For Shipboard Use, General Specification for. |
| MIL-C-24643 | - Cable and Cord, Electrical, Low Smoke, For Shipboard Use, General Specification for. |

STANDARDS

MILITARY

- | | |
|---------------|---|
| MIL-STD-167-1 | - Mechanical Vibrations of Shipboard Equipment (Type I - Environmental and Type II - Internally Excited). |
| MIL-STD-278 | - Welding and Casting Standard. |

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2.1.2 Other Government publications and documents. The following other Government publications and documents form a part of this standard to the extent specified herein.

PUBLICATIONS

NAVAL SEA SYSTEMS COMMAND (NAVSEA)

S9407-AB-HBK-010 - Electromagnetic Shielding Practices,
Shipboard.

0978-LP-003-9000 - Safety and Damage Control Facilities Liquid.

0900-LP-016-6081 - Quality Assurance Standards for Submarine
Antenna and Mast Assemblies.

DOCUMENTS

General Specifications for Ships, Section 075.

DDS 304-2 - Electric Cable Ratings and Characteristics.

DDS 305-1 - Designation and Marking of Electric System.

(Copies of specifications, standards, publications, and documents 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

3.1 Cableway tier. Cableway tier is one row of cable installed in a cableway.

3.2 Double banking. Double banking is two or more rows of cable installed in a single tier of a cableway.

4. GENERAL REQUIREMENTS

4.1 Location of cable runs. Main fore-and-aft cableways shall be located port and starboard, high and low in ship; lower cableways shall be through machinery spaces and corresponding platform decks, upper cableways under the main deck. This is to provide a quadrangular pattern to allow maximum athwartship and vertical separation of cables to loads requiring two sources of power for systems requiring alternate reliability circuits. For example, a ship service power feeder in the lower starboard cableway should have its complementary emergency or alternate feeder in the upper port cableway.

4.1.1 Vertical cable runs. Vertical cable runs shall be organized on the basis of the fore-and-aft or athwartship separation.

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4.1.2 Emergency diesel generator seawater booster pumps. Cables supplying emergency diesel generator seawater booster pumps shall be run in the same compartment with, and as close as practicable to, but shall not be attached to the water piping connecting the pump to the diesel engine.

4.1.3 Interior communications and weapons control. The main runs of interior communications and weapons control system cables shall follow cable runs of lighting and power installations. Interior communication and weapons control cables for circuits having several interrelated main and interrelated auxiliary circuits shall be run so that main circuits including normal power supply will be in one group and auxiliary circuits including alternate power supply will be in another group.

4.1.4 Control from more than one location. Where equipment is controlled from more than one location, the control cabling from each location to the equipment shall be installed in separate wireways.

4.1.5 Weather exposure. Cables shall not be exposed to the weather except where they penetrate a deck or bulkhead to supply equipment. Cables exposed to the weather shall be kept to a minimum. Where possible, cables to equipment on masts, staffs, macks, and yardarms shall be installed within masts, staffs, macks, and yardarms.

4.1.6 Circuit trunking. Location and arrangement of cable runs shall provide circuit trunking avoiding physical interferences with piping and ventilation ducts. Spaces considered harmful to cable or subject to explosion hazards shall be avoided. Cableways shall be arranged so that ventilation will be adequate for maintaining the minimum practicable temperature of cables within the cableway. Cableways shall be located so the cables will not be disturbed by disassembly or removal of machinery.

4.1.7 Armored cable. Armored cable is required to be used on all nuclear ships for propulsion plant and reactor compartments and is desirable in all other areas unless technically prohibited. The use of armored cable on non-nuclear ships is optional and to be determined by the building shipyard, except armored cables shall not be installed in weather locations due to EMC considerations.

4.1.8 Deadended cable. Cables installed through error or rendered useless as a result of modification shall be removed.

4.1.9 Gun mounts. Cables to gun mounts and directors shall be routed from the deck below through the center column in accordance with NAVSEA standard methods. Watertight integrity shall be maintained. Cable shall be located and installed to avoid the possibility of chafing. Non-flexing cables shall terminate in submersible or watertight changeover connection boxes at the point of connection to the flexible cables. Length of flexible cables between changeover connection boxes and the slack cable enclosure shall be kept to a minimum. The slack cable enclosure shall be entered through stuffing tubes. In compartments containing hydraulic systems, the cable installation shall not impair the airtightness or watertightness of decks and bulkheads forming the boundaries of the compartment.

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4.1.10 Rotating missile launchers. Cable connections to rotating missile launchers shall comply with drawings furnished by NAVORD.

4.1.11 Ballistic structures. Attachment of cables and supports to ballistic structures shall be in accordance with NAVSEA standard drawings and the following:

- (a) First preference shall be given to routing cables on the inboard or after bulkheads in the forward half of the ship, and on the inboard or forward bulkheads in the after half of the ship.
- (b) Second preference shall be given to routing cables on channels, or in cable racks on angles, attached to overhead deck beams.

4.1.12 Bulkheads and overheads. Cables shall not be routed on the outboard or forward bulkheads in the forward half of the ship, and on the outboard or after bulkheads in the after half of the ship, when the plating is 50 pounds per square foot (lb/ft²) or heavier. This routing shall also be avoided for lighter plating unless no other route is feasible. The installation of cables on the overhead and on bulkheads shall comply with NAVSEA standard methods. Cables for vital systems such as interior communication and weapons control systems shall not be secured to the overhead, or to shell planking, to shell plating or to ballistic bulkheads.

4.1.13 Magnetic minesweeping generators. Cable runs between magnetic mine-sweeping generators and minesweeping cable terminal boxes shall consist of four single-conductor cables arranged to form a quad. The cable centers of the quad shall form a square with alternate positive (+) and negative (-) polarity. The quad shall be twisted, having a right hand lay of 360 degrees each 10 feet. The outer jacket of adjacent cables in each quad shall be in contact with each other throughout the run. In the event that cables forming the quad pass through bulkhead stuffing tubes, separation of the outer jacket of adjacent cables shall not exceed 3 inches at the bulkhead and 1/2 inch at a distance of 1-1/2 feet from the bulkhead. The same maximum spacing limits shall apply at termination. Where space permits, a single community type stuffing tube shall be used for the cables of a quad when penetrating a watertight bulkhead. Details of the arrangement shall be in accordance with the standard plan for community type stuffing tubes on wood hull minesweepers.

4.1.14 Sonar system cables. Sonar system cables and other low frequency system cables shall be installed in accordance with the requirements of NAVSEA S9407-AB-HBK-010.

4.1.15 Hypergolic missile stowage areas. Installation and enclosure requirements for electric equipment located in hypergolic missile stowage area shall be in accordance with NAVSEA 0978-LP-003-9000.

4.2 Spare cable space allowance. In the organization of principal cableways, spare cable space of approximately 20 percent of that to be occupied by the final cable installation (as known at time of delivery of the ship) shall be reserved on cableways and in cable penetration areas for future cable installations. The additional cable space may consist of unused hangers or a combination of unused hangers and space available on used hangers, assuming

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that for future addition of cable, double banking will be allowed. During the design phase, the contractor shall provide cableway space in excess of the spare 20 percent in order to accommodate cables added as a result of developments occurring during the construction period. Through horizontal cable runs in aircraft carriers' hanger spaces will not be permitted. Through vertical runs such as those from the second deck to the gallery or flight deck levels shall be grouped to reduce the number of protective casings required and shall be protected from fire by NAVSEA standard methods.

5. DETAILED REQUIREMENTS

5.1 Cable slack. Cable slack requirements are as follows:

- (a) Cables shall be installed so that sufficient slack exists to allow for deflection of bulkheads.
- (b) Sag between hangers shall be uniform for each row of cables so that clearance between rows will be the same throughout the cable run.
- (c) Where cables spread out to enter bulkhead stuffing tubes, bends shall have liberal sweep to provide as much flexibility as practicable.
- (d) Cables having only a minimum spread where they pass through bulkhead stuffing tubes shall have enough slack to give them the same flexibility as other cables in the group.
- (e) Cables from switchboards or other electric equipment shall enter cableways in a curve of sufficient radius to prevent transmission of stresses to the equipment during severe cableway deflection.
- (f) Cables crossing expansion joints, such as those under the flight deck and gallery deck of aircraft carriers, shall have slack allowance at such points at least equal to the maximum movement of the expansion joints.

5.2 Cable bend radius. Cable bend radius shall be in accordance with NAVSEA'S Cable Comparison Handbook. The following general requirements are also applicable:

- (a) Bends at terminal entrances, where stuffing tubes are required, shall be made through angle stuffing tubes.
- (b) Straight stuffing tubes may be used in place of angle stuffing tubes if the bend in the cable is not less than the minimum bend radius.
- (c) Measurement point for minimum radius of bend is that surface of the cable jacket which is on the innermost portion of the cable bend.

5.3 Protection of cable.

5.3.1 Battle damage. Protection afforded by the ship structure shall be used to the greatest extent practicable. Cables shall not be run on the exterior of deck houses or similar structures above the main deck (including the island structure of aircraft carriers) except where necessary because of the location of the equipment served.

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5.3.2 Mechanical damage. Cables subject to mechanical damage because of their proximity to areas frequented by personnel shall be protected by metal casings. Cableways in areas where their misuse as steps or hand holds would cause damage shall be protected. Protective plates shall be installed over the cableways in all passages where cables might be stepped on. At hatch openings and in trunks where objects are raised or lowered, cables shall be protected by steel casings.

5.3.2.1 Auxiliary ship installation. Auxiliary (cargo) ship cable installations shall be routed outside cargo spaces wherever practicable. Where routing through cargo spaces is unavoidable, cables shall be protected from mechanical damage, including damage due to shifting of cargo.

5.3.2.2 Riser boxes. Riser boxes, or multiple cable penetrators with mechanical protection, shall be installed for three or more cables passing through a deck in a group. Where fewer than three cables pass through a deck, kickpipes shall be installed. Kickpipes installed in the vicinity of hydraulic equipment, where the possibility of oil leakage exists, shall be welded in place. Details of kickpipe installations and the installation of top bracing, where required, shall conform to this standard.

5.3.2.3 Oiler weather deck. Cableways installed on the weather deck of oilers shall be protected by a substantial open bottom steel enclosure. Cableways installed alongside or under weather deck catwalks shall be completely enclosed in a steel enclosure, the bottom section of which shall consist of a removable perforated steel plate. Enclosures shall be constructed so as to permit periodic inspection and maintenance of cables and hangers.

5.3.3 Excessive heat. Installation of cables in locations subject to excessive heat shall be avoided. Where required, heat insulating barriers or heat resistant types of cables shall be installed. Cable shall not be installed adjacent to machinery, piping or other surfaces having an exposed surface temperature greater than 70 degrees Celsius (°C). Cables shall not be run over boilers in the upper portions of firerooms or in other locations where they may be surrounded by hot air. Cables shall not be run in locations where they will be exposed to hot stack gases unless they are of heat resistant types protected by methods as shown in this standard.

5.3.4 Excessive moisture. Cables shall not be installed in locations where they may be subjected to excessive moisture. Where cable routing near firemain, water, steam, oil or other piping is unavoidable, drip-proof shields shall be provided for protection. Where cables must be installed in spaces subject to flooding, they shall be installed as high as practicable within the space. In such spaces, cable installation shall be arranged so as to permit the cables to be painted.

5.3.5 Cables installed through submerged spaces and voids. Cables that would normally be submerged, except for cables in the sonar dome, shall be enclosed in a single pipe in a manner similar to that for cables passing through tanks. Cable runs in voids and other dead air spaces shall be avoided. If it is not practicable to avoid cable runs in such spaces, cables shall be installed

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only in those spaces which are not provided with a means for flooding, and then only when temperature calculations show that the spaces have sufficient radiation area to maintain an ambient temperature at or below the temperature in which the cable was selected to operate. Cables shall be supported clear of decks and bulkheads to avoid condensate which might form on such surfaces.

5.3.6 Cable installations in hazardous locations. Cable runs shall be avoided through hazardous spaces such as the following (except such cable runs that terminate in or cannot be routed around these spaces):

- (a) Compartments where hazardous materials are stowed, such as explosive signalling apparatus, ready service ammunition, chemical warfare materials, photographic materials, film, paint, compressed oxygen, chlorine and combustible gases.
- (b) Diesel, JP-5, and fuel tanks and stowage compartments (stowage in separate tanks or containers).
- (c) Gasoline hazard areas.
- (d) Hangar spaces.
- (e) LOX (liquid oxygen) handling and transfer spaces.
- (f) Magazines and other spaces where exposed powder is handled or stored.
- (g) Missile magazines.
- (h) Warhead, depth charge, mine charge, aerial bomb and cased explosives magazines.

Cables within hazardous spaces shall be protected against mechanical damage. This protection shall be in the form of nontight metal guards (expanded or solid) of sufficient strength to provide the required protection. Clearance shall be provided between the protective guards and the cables to provide ample ventilation. Protective guards shall be provided with drainage holes where required. Cables protected by the ship structure or by permanently installed equipment are considered adequately protected. Only cables having conductor insulation of silicone rubber (except for interior communication and weapons control cables totally within the compartment) shall be used. Through cables shall be of unbroken length within compartments. Cables terminating at lighting fixtures or other equipment shall be of broken lengths. Separate cables to each lighting fixture are not required; a single cable may be run between fixtures where more than one fixture is installed in a space.

5.3.7 Channel rubber. Channel rubber shall be used with banding straps in cableways to protect the outer jacket of cables from being cut and coaxial cables from being deformed by the banding strap. For cableways that have unarmored cable in contact with banding straps, channel rubber is required only in the following instances:

- (a) For each banding strap of a vertical cableway.
- (b) For each banding strap at a cableway bend, including breakout bends.
- (c) For rubber jacket and coaxial cables in contact with the banding strap. These cables, however, should be run in the middle of the cableway for increased mechanical protection.
- (d) For submarine external cableways.

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Where hose clamp cable retention devices are used, channel rubber is not required, except when coaxial cable would otherwise be in contact with the hose clamp cable retention device. For cableways that have only armored cables in contact with the banding strap, channel rubber is not required.

5.4 Installation of propulsion system cables. Propulsion system cables shall be installed in cableways separate from those used for other electrical system cables. Direct current or alternating current propulsion system cables shall be arranged and installed in such manner as to minimize heating of adjacent structural material by induced currents. Alternating current propulsion cables installed on insulating hangers shall be grounded at approximately the midpoint of the cable run. Propulsion system cables shall not be installed in bilges. When cables are located near dripping water, or oil, they shall be protected by drip covers. These protective covers shall be spaced away from the cables so as not to restrict ventilation. Cables entering propulsion system equipment from above or from the sides shall enter through stuffing tubes and shall be braced and secured to prevent dislodgment under vibration, shock and magnetic stresses. The ends of propulsion system cables 9,000 circular mils and larger shall be sealed with solderless waterseal type lug terminals in accordance with MIL-T-16366.

5.5 Cable handling and stowage. All cables except flexing service and silicone rubber insulated type of MIL-C-915, MIL-C-24643 and MIL-C-24640 shall be given the following special handling at temperatures below 35 degrees Fahrenheit (°F):

- (a) If the compartment in which the cable is to be installed cannot be heated, the cable shall first be stored in an ambient temperature of at least 50°F but not above 120°F until it is warm enough to be completely installed before it cools to 35°F.
- (b) If cable must be installed when its temperature is 35°F or lower, extra care will be required. The radius of bends shall be not shorter than the minimum values in DDS 304-2. Before bending to the final radius, that portion of the cable comprising the bend shall be warmed thoroughly by a portable warm air blower.
- (c) Cable shall be stored in a dry place which is not subject to accidental flooding, protected from the weather, and subjected to a minimum variation of temperature.
- (d) Portable cables for aircraft servicing shall be stowed in bins. In hangar bay areas, they shall be stowed on cable racks.
- (e) Cable that has been in storage for prolonged periods may be installed provided a visual inspection shows that it has sustained no mechanical damage that would impair the water-tight integrity of its outer sheath.
- (f) Cable armor showing signs of corrosion shall be cleaned and a coat of zinc-chromate primer applied to all corroded areas.

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5.6 Cable tags. All permanently installed cables shall be tagged to each point of connection, and on both sides of decks and bulkheads except as follows:

- (a) Where through cable runs within a compartment are direct (such as a vertical run between decks), a single tag will suffice.
- (b) For cables with both points of connection within a compartment and which can be readily traced, a single tag will suffice.
- (c) Where compartments are subdivided by internal bulkheads or where machinery or installed equipment makes tracking of cable runs difficult, additional tags shall be provided.
- (d) For multiple cable penetrations of decks and bulkheads (main cableways), individual cable tags can be omitted, and in lieu thereof, an identification plate shall be installed adjacent to the cableway penetration area showing each cable designation in the order of location in the penetration area.

Cable tags shall be in accordance with DDS 305-1. Capital letters shall be used on cable tags; height of all letters and numbers shall be not less than 3/16 inch, and letters and numbers shall be embossed to at least 1/64 inch above the surface.

5.7 Cable hangers and supports. Cable hangers and supports shall meet the following requirements.

- (a) MIL-S-901 shock.
- (b) MIL-STD-167-1 vibration.
- (c) Minimum weight.
- (d) Minimum maintenance on cable supporting systems.
- (e) Facilitate cabling procedures.
- (f) Convenience of servicing system.
- (g) Fireproof except in specific areas such as wooden ships.
- (h) Material used is non-toxic under all conditions.
- (i) Free of sharp protrusions, corners, items, and so forth, dangerous to personnel.
- (j) Shall be designed to permit repair with local market items. It is not intended that extensive back-up stocks be supplied for item by item replacement.
- (k) Compatible with and non-damaging to cables.

5.7.1 Insulation spacer block. The use of insulation spacer blocks is mandatory for propulsion system cables in order to prevent bunching.

5.7.2 Shock design. All cable supporting arrangements shall be tested for resistance to shock and vibration. Deformation to supporting members and retaining members is satisfactory providing cables are prevented from becoming whips or missiles and retainers, racks and supports do not become missiles. Shock and vibration tests shall be conducted at an approved laboratory. No mechanical damage shall occur to cable specimens, and insulation resistance shall comply with cable specifications before and after the testing. Copies of the shock test, with details of any damage and clear photographs of the damage to cable supports or cables, certified by the Government inspector witnessing the test shall be forwarded to NAVSEA, Code 56224. Copies shall also be furnished to purchasing activities upon request. These tests shall be conducted by each manufacturer

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for each type hanger supplied. Retesting shall be required when design, manufacturing process, or material is changed. Testing of a hanger with lesser tiers or lesser dimensions and spacing shall not be extended or exempt from testing for other hangers. The cable supports when tested shall be loaded with maximum design cable load. Material is not satisfactory unless it has successfully passed these tests. Shock tests shall be in accordance with MIL-S-901, class I. Cable supporting devices shall be arranged for testing as follows:

5.7.2.1 Multiple cable test racks (15 inches free length of cable support).

If multiple cable racks are being tested for ability of cable support member only to withstand shock and vibration as fully loaded, a minimum of three supporting stations with 32-inch, 21-inch or 16-inch spacing shall be provided. The maximum number of the largest cables that can be accommodated on these racks shall be applied. Cable overhang at each end shall be 16 inches or one-half the distance between supports. If tiers of multiple cable racks and supporting devices for attachments to ships' structure are to be tested for capability to withstand shock and vibration, a duplicate of the assembly proposed for shipboard installation with a minimum of three supporting stations with 32-inch, 21-inch or 16-inch spacing shall be provided. The maximum number of the largest cables that can be accommodated on these racks shall be applied. Cable overhang at each end shall be 16 inches.

5.7.2.2 Single cable supports. All single cable supports shall be tested.

These shall be arranged using a minimum of three supporting stations spaced 32 inches, 21 inches or 16 inches apart. Cable overhang shall be 16 inches. Maximum size cables shall be mounted with these single cable supports. Two, three or four cables supported as shown on figure 4C5, or by use of retainer bars or straps, shall be arranged for tests in a manner similar to that for single cables. A single tier of cables shall be arranged as described for multiple cable racks.

5.7.3 Installation.

5.7.3.1 Spacing. Spacing of steel and aluminum cable supports shall be 32 inches except as follows:

- (a) The spacing of hangers shall be 21 inches to reduce cable sag in cable racks when headroom clearance under the cable racks before installation of cables is 6 feet 7 inches or less (6 feet 4 inches minimum).
- (b) Hangers for overhead multiple tier aluminum cableways, when welded to aluminum decks, shall be spaced 16 inches and the number of tiers shall be limited to three.
- (c) The spacing of hanger supports for single cables or single tier of cables shall be 32 inches but may be adjusted between 32 inches and 16 inches as necessary to suit particular ship conditions.

5.7.3.2 Cable racks. A maximum of five single tiers of cables may be supported from an overhead in one cable rack. Aluminum tiers shall be limited to three. A maximum of two tiers of cables may be supported from bulkheads in

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one cable rack. Eight tiers of double banked cables may be supported in main cableways in machinery spaces and boiler rooms, when approved by NAVSEA. Backing plates are not required for cable support except that when bulkheads are 1/16-inch thick or less and cable run is over 4 inch width, backing washers shall be used. Multiple tiers of cable shall not exceed two on bulkheads except in congested locations, in which case 3 tiers may be used on request and subject to NAVSEA approval. Cable support angles shall be secured to ship structure by 180 degree weld except that in the following cases, the weld shall be 360 degrees:

- (a) Where the number of tiers of 15-inch cable rows in wireway exceeds two.
- (b) When welding to ballistic structure.
- (c) When the welds are in wet spaces such as weather decks or shower rooms.

5.7.3.2.1 Support components. Cable support components shall be of the following materials:

Nonmagnetic vessels

Inboard

Hangers - aluminum
Supports - aluminum
Ferrules - CRES or aluminum
Bolts and nuts - CRES or aluminum
Banding - aluminum

Outboard

Hangers - aluminum
Supports - aluminum
Ferrules - CRES
Bolts and nuts - CRES
Banding - CRES

Other vessels

Inboard

Hangers - aluminum or steel^{1/}
Supports - aluminum or steel
Bolts and nuts - steel-zinc plated
Banding - steel-zinc plated

Outboard

Hangers - aluminum or steel^{1/}
Supports - aluminum or steel
Bolts and nuts - CRES
Banding - CRES

- ^{1/} If aluminum hangers or supports are being utilized, a steel hanger or support or both shall be installed in lieu of an aluminum hanger or support at least every 6 feet.

Appropriate method details specified as submarine only may be utilized for surface ship applications, particularly for weather deck, wet/humid areas, and hull applications. Aluminum cable supports may be attached to steel deck and bulkhead where suitable design and interface is approved. Cable hangers shall be bracketed away from deck and bulkhead surfaces in food handling and food storage spaces to permit spraying for insect control.

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5.7.3.3 Double banking of cable. Not more than one row of cables shall be installed on a cable hanger. Where space is limited, and if specific approval has been obtained, double banking of cables on hangers will be permitted provided the clearance between the top of the upper layer of cables and the hanger above shall be at least 3/8 inch.

5.7.3.4 Cable retention. Devices for cable retention meeting the requirements of 5.7 and 5.7.2 are required on horizontal cable supports in multiple racks. Retention of cables on supports can be accomplished by the use of retainers such as contour straps, soft iron flat bars bent over the cables, semi-contour straps or angle iron retainers. Non-toxic strips or channel material shall be used with semi-contour straps, bars and angle retainers to reduce cable damage, distortion, and chafing. On cable runs in which the cable is vertical, cable retention is required at every hanger.

- (a) Cable retention spacing shall be as specified in 5.7.3.1.
- (b) Cable straps shall be omitted on horizontal cable runs except as follows:
 - (1) Where the hanger has no side brackets.
 - (2) At those locations where the cable runs change direction or pass through beams or bulkheads.
 - (3) Where four consecutive hangers would not require straps. In this case, a minimum of one strap shall be installed on every fourth hanger.

5.7.3.5 Plastic sealer. After the cables are properly secured, plastic sealer electrical insulation, MIL-I-3064, type HF, shall be used to seal the space around the cable as follows:

- (a) In cable clamps and bushings entering the top of an electrical enclosure.
- (b) In bushings, collars or nipples used for passing cables through lighttight and fumetight bulkheads.

5.7.3.6 Welding. Welding shall be in accordance with MIL-STD-278.

5.7.3.7 Threaded fastener. Threaded fasteners shall be in accordance with the General Specifications for Ships, Sections 075; for submarine antenna and mast material, see NAVSHIPS 0900-LP-016-6081. Unless otherwise specified, threaded fasteners of normally stocked lengths shall be used. Male threads on threaded fasteners, after being installed and tightened, shall protrude at least one thread beyond the top of the nut or plastic locking element. Excessive protrusion shall be avoided, particularly where necessary clearances, accessibility, and safety are important. Where practicable, the number of threads protruding shall not exceed five; however, in no case shall thread protrusion exceed ten threads. Washers shall not be used for the sole purpose of lessening thread protrusion.

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5.7.3.8 Collar studs. Collar studs shall be in accordance with MIL-S-24149.

5.7.4 Deadended cable. Cables installed through error or rendered useless as a result of modifications shall be removed. Vacated and unused penetrations shall be sealed by methods which satisfy the tightness requirements of the structure penetrated.

6. NOTES

6.1 Intended use. This section specifies the requirements for Submarine and Surface Ship Cableways and Protection 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 Methods Military Standard (DOD-STD-2003-4) contains drawings that depict Standard Methods that are applicable for general electric plant installation on both surface ships and submarines. Each drawing has been assigned a figure number. The methods shown on the figures are grouped together providing similar functions. These groups are:

DOD-STD-2003-4 (Cableways) Group A. Cableways (Submarines)
B. Cableways (Surface Ships)
C. Cableways (General)
D. Cable Protection

The methods shown on the figures are identified by the following alphanumeric designation system:

METHOD 4A142

4	A	14	2	
				Method (always the last number)
				Sequential number (old sheet number)
				Group number
				Military standard section 4

Thus, method 4A142 identifies method 2, sequential number 14 in group A of DOD-STD-2003-4.

6.3 Subject term (key word) listing.

Cableways (submarines)
Cableways (surface ships)
Cableways (general)
Cable protection

Preparing activity:
Navy - SH
(Project GDRQ-N066-4)

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NOTES:

1. HANGERS WITH 16" CENTER SPACING IS THE MAXIMUM SIZE THAT CAN WITHSTAND 74 SHOCKS WHERE THE NUMBER OF CABLES EXCEEDS THE MAXIMUM SIZE OF SUPPORT SHOWN. ADDITIONAL WRENCHWAYS SHALL BE PROVIDED.
2. METHODS SHOWN ON THIS SHEET MAY BE USED FOR GENERAL INSTALLATION WHERE APPLICABLE.
3. THIS FIGURE SUPERSEDES SHEET 4A1 OF DWG. 800-3001027 AND SECTION 5, SHEET 28, OF DRAWING NAVSEC. NO. 8000-56202-73980.

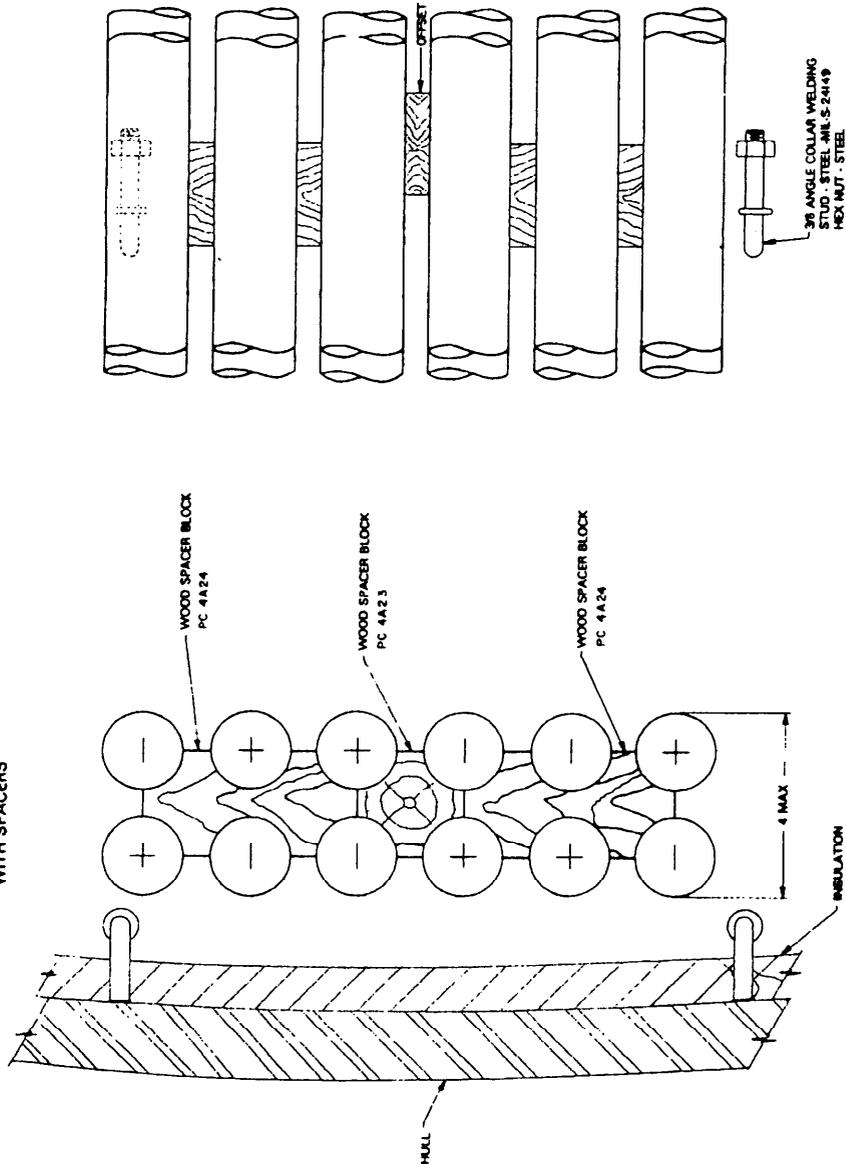


FIGURE 4A1. Main cableway for battery cables (submarines).

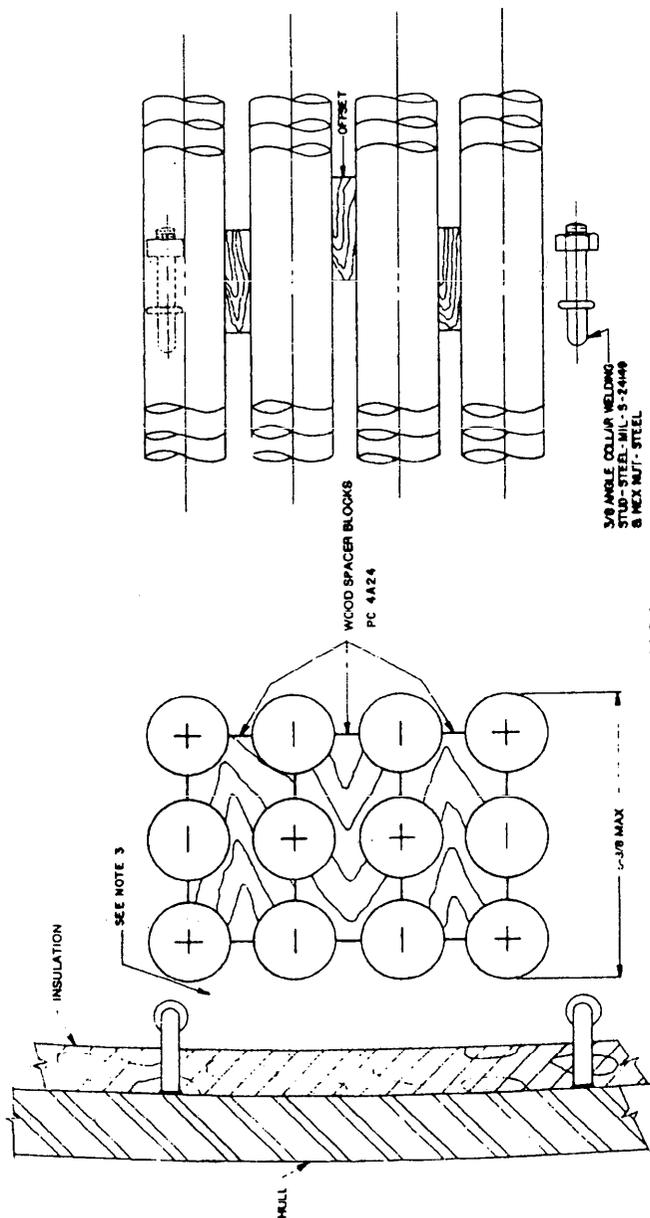
SH 132317204

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NOTES:

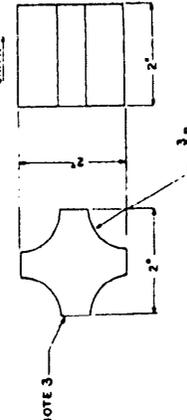
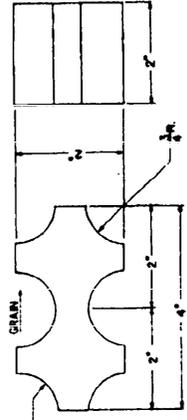
1. THE METHOD SHOWN ON THIS FIGURE MAY BE USED FOR GENERAL INSTALLATION WHERE APPLICABLE.
2. HANGERS WITH 16" CENTER TO CENTER SPACING IS THE MAXIMUM THAT CAN WITHSTAND HI SHOCKS WHERE THE NUMBER OF CABLES EXCEEDS THE MAXIMUM SIZE OF SUPPORT SHOWN. ADDITIONAL WIREWAYS SHALL BE PROVIDED.
3. MATERIAL - MAPLE FINISHED WITH TWO COATS OF VARNISH, SPEC. IT-V-121
4. THIS FIGURE SUPERSEDES SHEET 4A2 OF DWG. 803-6001027 AND SECTION 1 SHEET 54 AND SECTION 6, SHEET 38 OF DRAWING. NAVSEC NO. 9000-98202-73880

4A21
BANK OF 12 CABLES
ARRANGED IN TRIPLE VERTICAL TIERS
WITH SPACER BLOCKS



4A24
WOOD SPACER BLOCKS
FOR SIX CABLES

4A23
WOOD SPACER BLOCK
FOR FOUR CABLES



SEE NOTE 3

NOTE 3

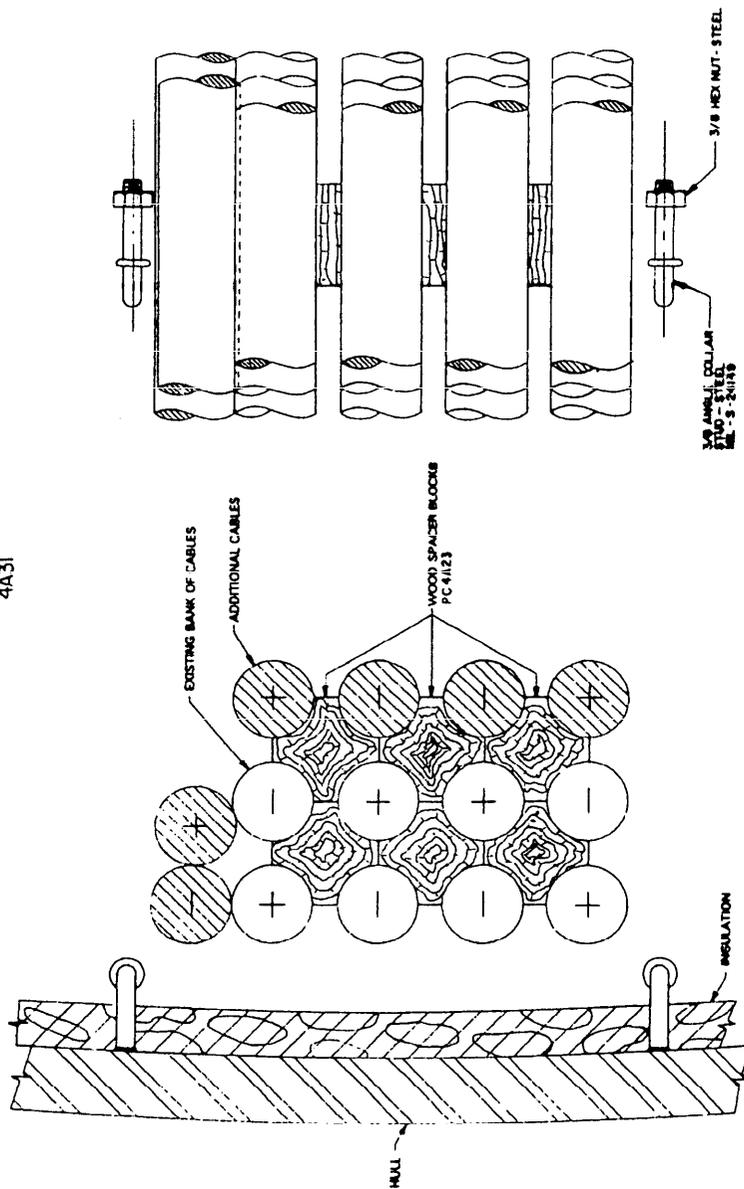
FIGURE 4A2. Main cableway for battery cables (submarine).

SM 132317205

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- NOTES:
1. HANGERS WITH 16" CENTER TO CENTER SPACING IS THE MAXIMUM SIZE THAT CAN WITHSTAND 14 SHOCK WHERE THE NUMBER OF CABLES EXCEED THE MAXIMUM SIZE OF SUPPORT. ADDITIONAL WREWAYS SHALL BE PROVIDED.
 2. PROCEDURES SHOWN ON THIS SHEET MAY BE USED FOR GENERAL INSTALLATION.
 3. THIS FIGURE SUPERSEDES SHEET 4A3 OF DWG 803-5001027 AND SECTION 6, SHEET 37 OF DRAWING NAVSECC NO. 8000-54202-71960

4A31



SH-132317206

Figure 4A3. Addition of cable to existing battery cableway (submarine).

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- NOTES:
1. THE FIRST HANGER NEXT TO THE BULKHEAD SHALL BE LOCATED TO SUIT CABLE BENDS AT PENETRATION BUT SHALL NOT EXCEED 32".
 2. THIS FIGURE SUPERSEDES SHEET 4A4 OF DRAWING 800-6001027 AND SECTION 5, SHEET 40, OF DRAWING MAVSEC NO. 8000-96202-73860.

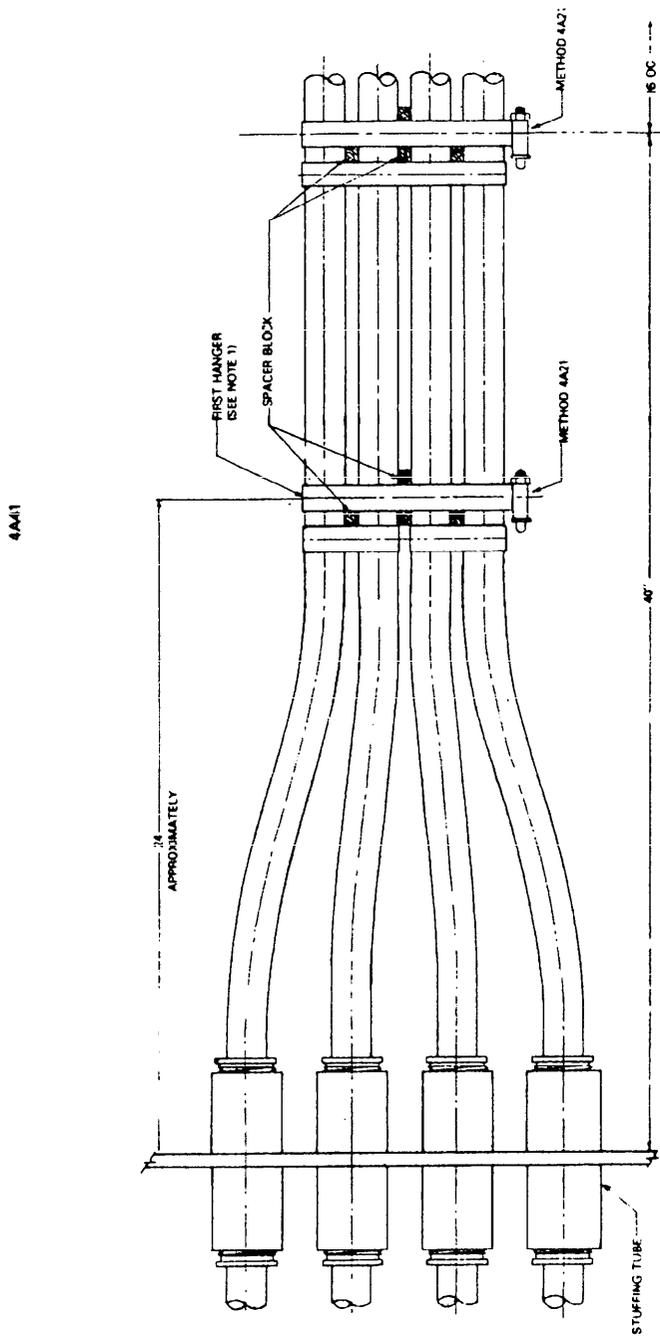


FIGURE 4A4. Cableway adjacent to bulkhead penetration (submarines).

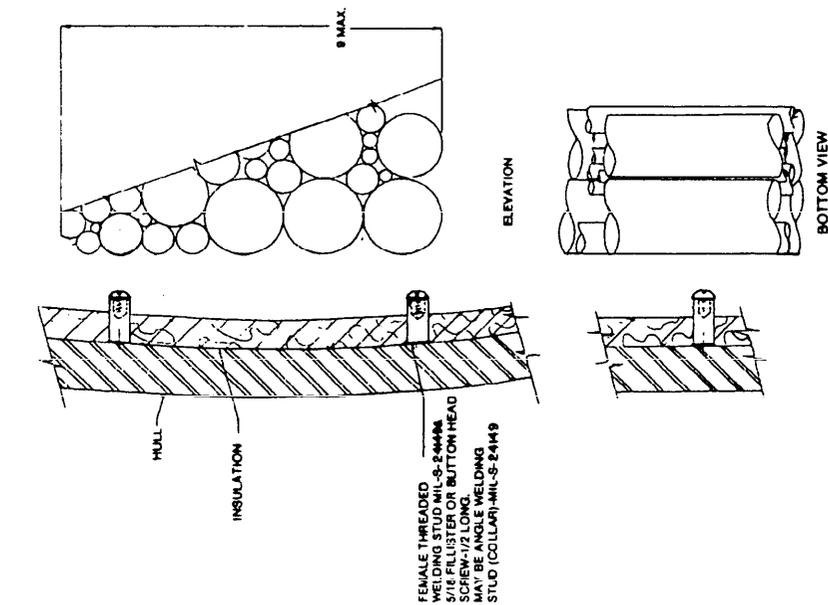
SH 132s-17207

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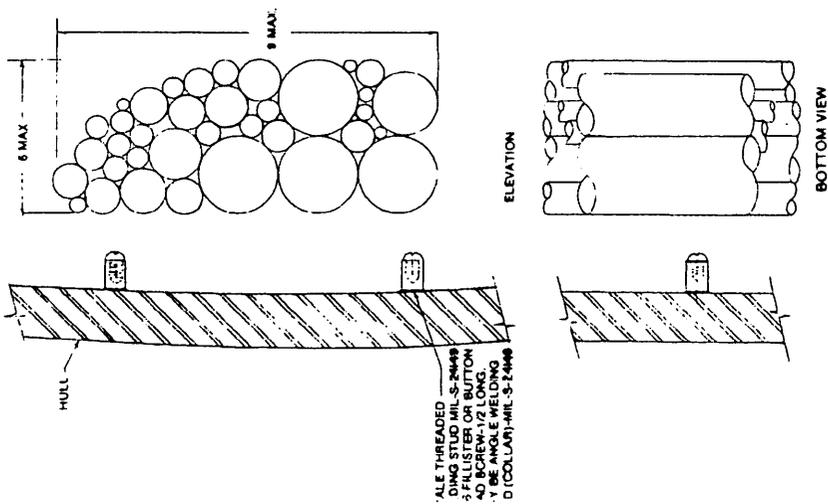
NOTES:

- 1. HANGERS WITH A 16" CENTER TO CENTER SPACING IS THE MAXIMUM SIZE THAT CAN WITHSTAND A SHOCK WHERE THE NUMBER OF CABLES EXCEEDS THE MAXIMUM SIZE OF SUPPORT SHOWN. ADDITIONAL WRENCHES SHALL BE PROVIDED.
- 2. THIS FIGURE SUPERSEDES SHEET 4A5 OF DRAWING 809-100-1027 AND SECTION 5, SHEET 3A OF DRAWING NAVSEC NO. 6000-96002-73900.

4A52
CABLE BANKS
SUPPORTED BY WELDING STUDS ON HULL
WITH INSULATION



4A51
CABLE BANKS
SUPPORTED BY WELDING STUDS ON HULL
WITHOUT INSULATION



SH 132317208

FIGURE 4A.5. Cabway for auxiliary cables (submarine).

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- NOTES:
1. METHODS SHOWN ON THIS FIGURE MAY BE USED FOR GENERAL INSTALLATION WHERE APPLICABLE.
 2. CABLES SHALL BE ARRANGED SO THAT THE LARGER CABLES ARE IN THE CENTER OF THE HANGER IF POSSIBLE.
 3. THIS FIGURE SUPERSEDES SHEET 448 OF DRAWING RIG-5001027 AND SECTION 5, SHEET 38, OF DRAWING NAVSPEC NO. 9000-96202-73980.

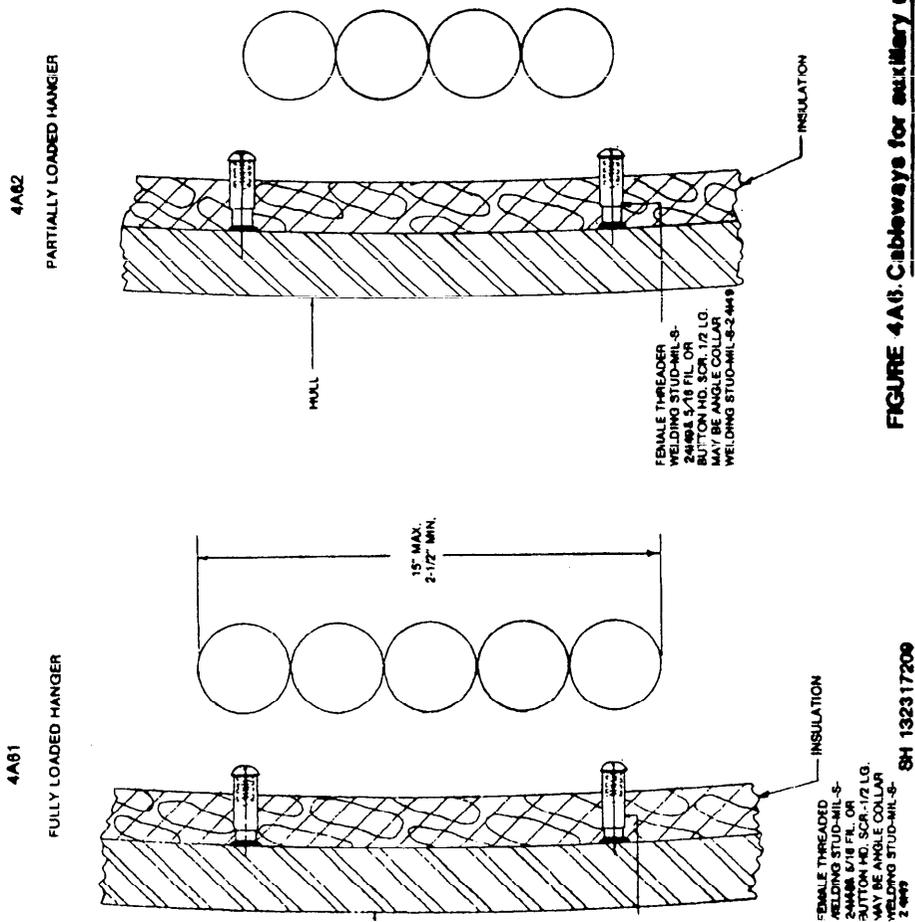


FIGURE 4A8. Cableways for auxiliary cables (submarines only).

SH 132317209

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NOTES:
1. THIS FIGURE SUPERSEDES SHEET 4A7 OF DRAWING 803-8001027 AND SECTION 5, SHEET 1, OF DRAWING NAVSEC NO. 9000-58202-73980

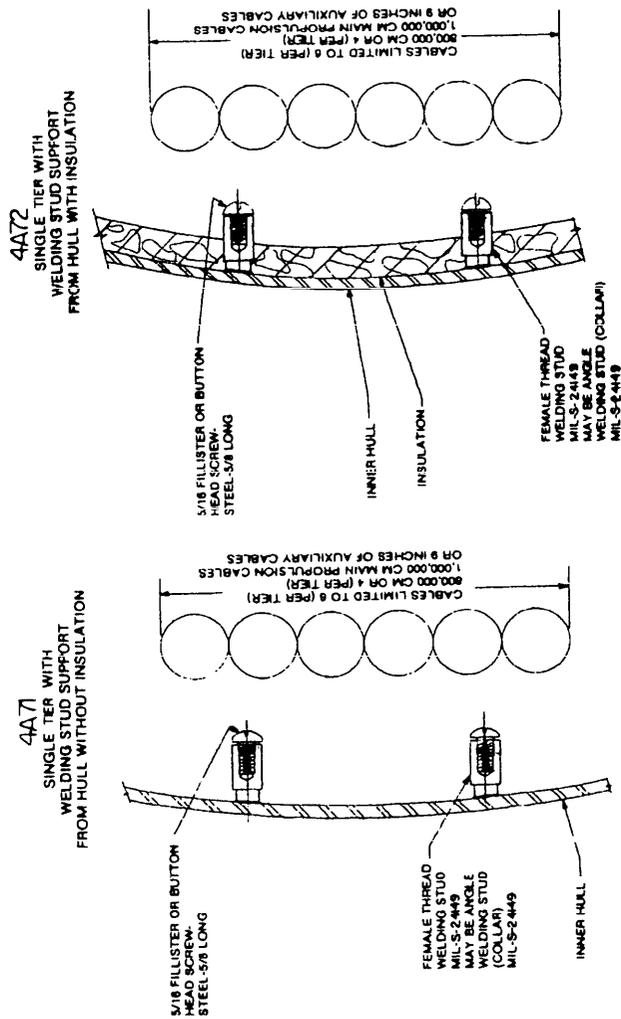
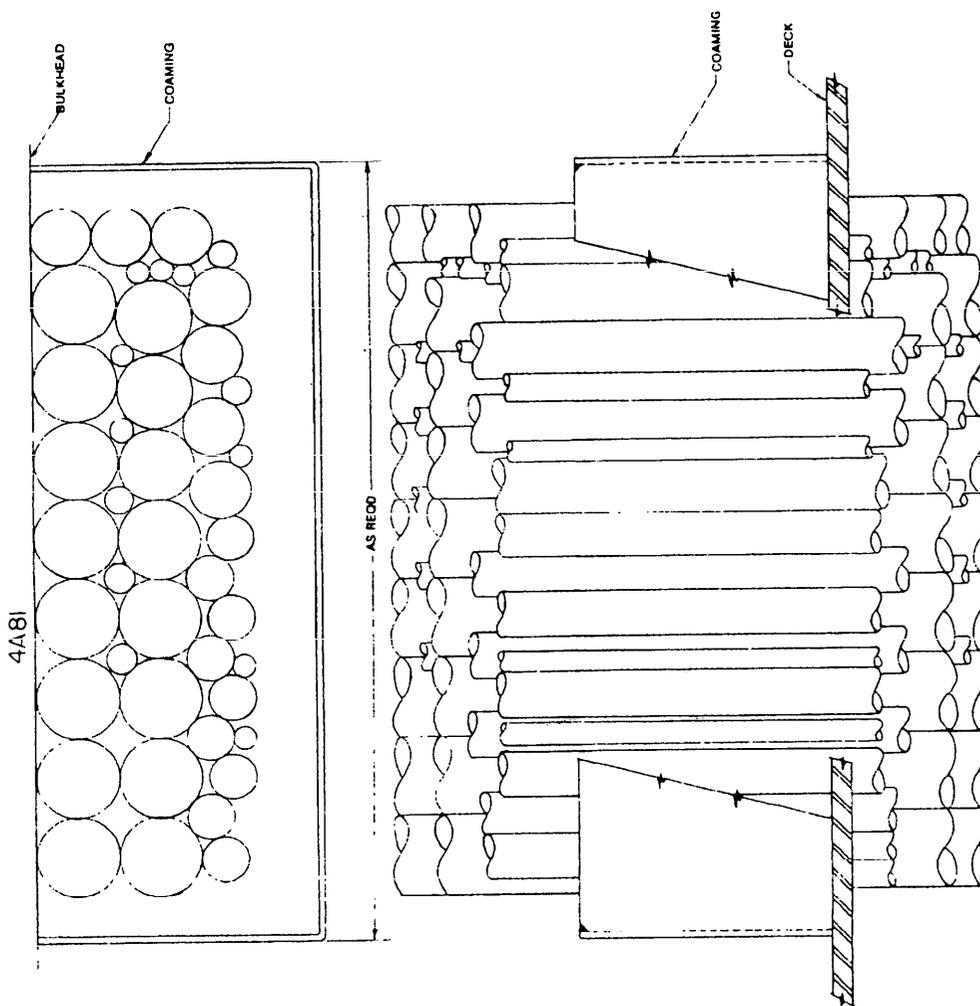


FIGURE 4A7. Single row cableway (submarine).

SH 138317210

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- NOTES:
1. THIS METHOD IS FOR VERTICAL CABLE RUNS ONLY.
 2. THIS FIGURE SUPERSEDES SHEET 4A8 OF DRAWING 803-5001027 AND SECTION 6, SHEET 41, OF DRAWING NAVSEC NO. 8000-55702-73890.



SH 132317211

FIGURE 4A8. Cableway through coamings and hatchways (submarines).

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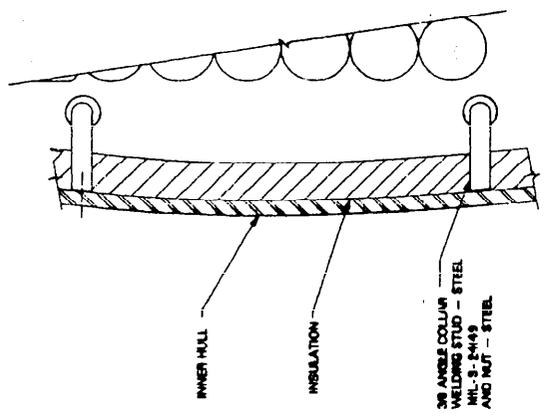
THIS SHEET INTENTIONALLY LEFT BLANK

SH 132317212

DOD-STD-2003-4 (NAVY)
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- NOTES:
1. HANGERS WITH 16" CENTER TO CENTER SPACING IS THE MAXIMUM SIZE THAT CAN WITHSTAND 14 SHOCK WHERE NUMBER OF CABLES EXCEEDS THE MAXIMUM SIZE OF SUPPORT SHOWN. ADDITIONAL WIRWAYS SHALL BE PROVIDED.
 2. THIS FIGURE SUPERSEDES SHEET 4A10 OF DRAWING 803-6001027 AND SECTION 5, SHEET 2, OF DRAWING NAVSEC NO. 9000-58202-73940.

4A102
CABLE BANKS
SUPPORTED BY WELDING STUDS
ON INNER HULL WITH INSULATION



4A101
CABLE BANKS
SUPPORTED BY WELDING STUDS
ON INNER HULL WITHOUT INSULATION

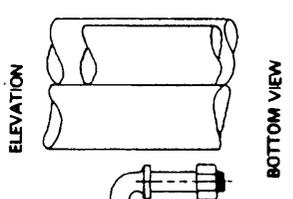
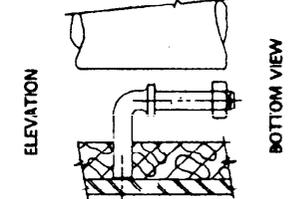
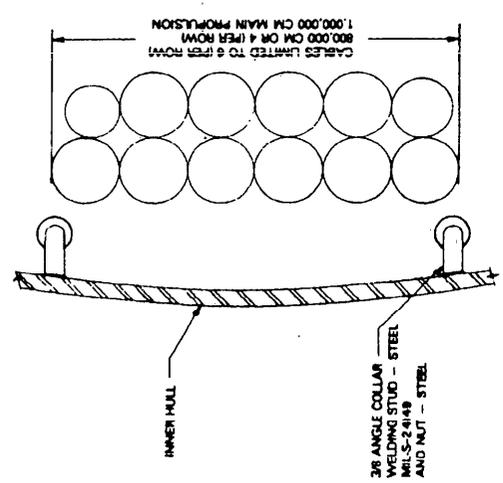


FIGURE 4A10. Cableway for double bank of main propulsion cables (submarines).

84 1323172 13

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NOTE:
1. THIS FIGURE SUPERSEDES SHEET 4A12 OF
DRAWING 803-5001027

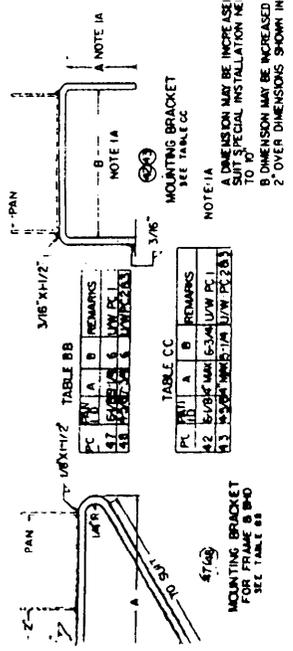


TABLE BB

PC	QTY	A	B	REMARKS
47	1	1/2	1/8	MOUNTING BRACKET FOR FRAME B & B90
48	1	1/2	1/8	MOUNTING BRACKET FOR FRAME B & B90

TABLE CC

PC	QTY	A	B	REMARKS
42	1	1/2	1/8	MOUNTING BRACKET FOR FRAME B & B90
43	1	1/2	1/8	MOUNTING BRACKET FOR FRAME B & B90

NOTE 1/A
A DIMENSION MAY BE INCREASED TO
SUITS SPECIAL INSTALLATION NEEDS UP
TO 10"
B DIMENSION MAY BE INCREASED UP TO
2" OVER DIMENSIONS SHOWN IN TABLE CC.

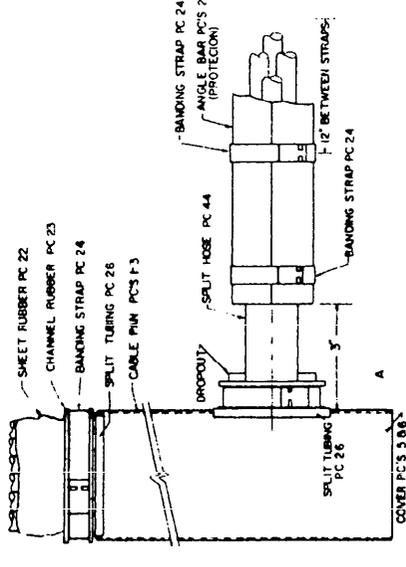
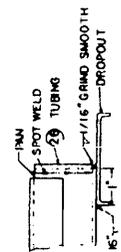


TABLE DD

PC	QTY	A	B	C	D	E	REMARKS
1	1	3/8	3/4	3/8	1/2	1/2	COVER
2	1	3/8	3/4	3/8	1/2	1/2	COVER
3	1	3/8	3/4	3/8	1/2	1/2	COVER

3/4" DIA HOLE 1" FROM EACH
END OF PAN. ONE HOLE 1/4"
FROM END OF PAN. HOLE 1/4"
FROM END OF PAN. HOLE 1/4"
FROM END OF PAN. HOLE 1/4"
FROM END OF SECTION

3/8" X 1/2" HORIZ SLOTTED HOLES
TO BE INSTALLED BEFORE
BANDING HOLES ARE SPACED
PART, SPACING 2" IN
FROM END OF SECTION

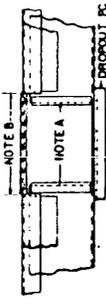


METHOD OF ATTACHING DROPOUT

TABLE EE

PC	QTY	REMARKS
15	1	6/16 PC
16	1	25/32 PC
17	1	1/2 PC
18	1	3/4 PC

NOTE
A HOLE IS TO BE 1/8" LARGER
THAN THE HOLE IN THE
CABLES. HOLE SIZE
IS TO BE 2-1/8" HEADING
IN TO ANGLE BAR RUMS.
B COVER IS TO BE CUT BACK
1/2" LARGER THAN HOLE IN
PAN



TYPICAL SECTION
SHOWING OPENING IN PAN & COVER

PC	QTY	REMARKS	PC	QTY	REMARKS
64	1	LOC WASHER 3/8"	CMS	17	7/8 BA
63	1	BOLT 1/4" X 3/8" X 1/2"	CMS	00-5-763	
62	1	BOLT 1/4" X 3/8" X 1/2"	CMS	00-5-763	
61	1	COVER PLATE (ID 2")	STEEL	WIL-5-12288	
60	1	ANGLE BAR (3/8" X 1/4")	WIL-5-12288		
59	1	FLAT BAR (1/4" X 1/2")	WIL-5-12288		
58	1	FLAT BAR (1/4" X 1/2")	WIL-5-12288		
57	1	FLAT BAR (1/4" X 1/2")	WIL-5-12288		
56	1	ELASTIC STOP NUT, 1/4"-18	WIL-5-12288		
55	1	ELASTIC STOP NUT, 1/4"-18	WIL-5-12288		
54	1	MOULT 1/4" X 3/8" X 1/2" X 1/4"	WIL-5-12288		
53	1	MOULT 1/4" X 3/8" X 1/2" X 1/4"	WIL-5-12288		
52	1	MOULT 1/4" X 3/8" X 1/2" X 1/4"	WIL-5-12288		
51	1	MOULT 1/4" X 3/8" X 1/2" X 1/4"	WIL-5-12288		
50	1	MOULT 1/4" X 3/8" X 1/2" X 1/4"	WIL-5-12288		
49	1	MOULT 1/4" X 3/8" X 1/2" X 1/4"	WIL-5-12288		
48	1	MOULT 1/4" X 3/8" X 1/2" X 1/4"	WIL-5-12288		
47	1	MOULT 1/4" X 3/8" X 1/2" X 1/4"	WIL-5-12288		
46	1	MOULT 1/4" X 3/8" X 1/2" X 1/4"	WIL-5-12288		
45	1	MOULT 1/4" X 3/8" X 1/2" X 1/4"	WIL-5-12288		
44	1	MOULT 1/4" X 3/8" X 1/2" X 1/4"	WIL-5-12288		
43	1	MOULT 1/4" X 3/8" X 1/2" X 1/4"	WIL-5-12288		
42	1	MOULT 1/4" X 3/8" X 1/2" X 1/4"	WIL-5-12288		
41	1	MOULT 1/4" X 3/8" X 1/2" X 1/4"	WIL-5-12288		
40	1	MOULT 1/4" X 3/8" X 1/2" X 1/4"	WIL-5-12288		
39	1	MOULT 1/4" X 3/8" X 1/2" X 1/4"	WIL-5-12288		
38	1	MOULT 1/4" X 3/8" X 1/2" X 1/4"	WIL-5-12288		
37	1	MOULT 1/4" X 3/8" X 1/2" X 1/4"	WIL-5-12288		
36	1	MOULT 1/4" X 3/8" X 1/2" X 1/4"	WIL-5-12288		
35	1	MOULT 1/4" X 3/8" X 1/2" X 1/4"	WIL-5-12288		
34	1	MOULT 1/4" X 3/8" X 1/2" X 1/4"	WIL-5-12288		
33	1	MOULT 1/4" X 3/8" X 1/2" X 1/4"	WIL-5-12288		

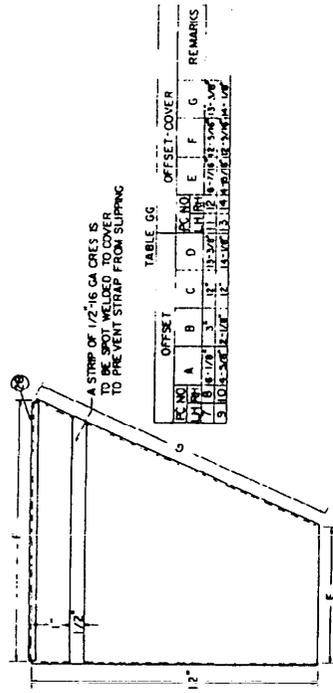
(CONTINUED FROM FIGURE 4A11)

FIGURE 4A12 External wireways installation standard methods (submarines).

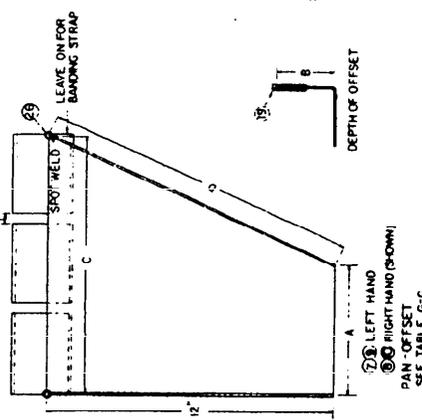
SH 1323172 16

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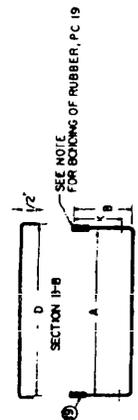
- BONDING NOTES FOR PC 19
- 1 SOLVENT WET THE CABLE AND THE CABLE PAN IN THE AREA TO BE BONDED WITH THIN SOLVENT. BRUSH ON THE CABLE PAN AND BRUSH ON THE CABLE WITH THIN SOLVENT. BRUSH ON THE CABLE WITH THIN SOLVENT. BRUSH ON THE CABLE WITH THIN SOLVENT.
 - 2 APPLY A COAT OF CARBOLINE NEOPRENE TO THE CABLE PAN AND BRUSH ON THE CABLE WITH THIN SOLVENT. BRUSH ON THE CABLE WITH THIN SOLVENT. BRUSH ON THE CABLE WITH THIN SOLVENT.
 - 3 IN THE MEANTIME, SOLVENT WIPE THE AREA OF THE NEOPRENE EXTRUSION TO BE BONDED WITH THIN SOLVENT. BRUSH ON THE CABLE WITH THIN SOLVENT. BRUSH ON THE CABLE WITH THIN SOLVENT.
 - 4 CARBOLINE NEOPRENE TO THE CABLE PAN. BRUSH ON THE CABLE WITH THIN SOLVENT. BRUSH ON THE CABLE WITH THIN SOLVENT. BRUSH ON THE CABLE WITH THIN SOLVENT.
 - 5 FOR PIECE NUMBERS SHOWN HEREON, SEE FIGURES 4A118A412.



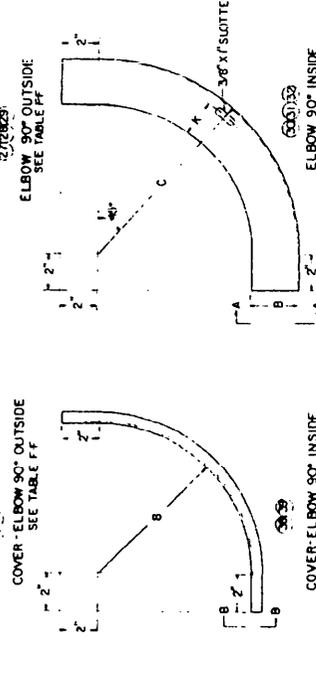
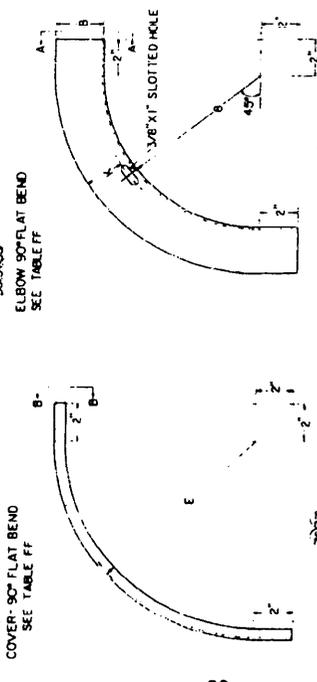
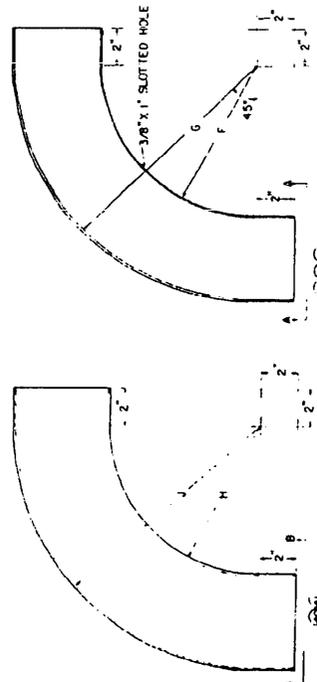
NOTE: IF OFFSET IS FOR 3 IN. USE OF FITS, INSTALL 3 DROPOUTS PER IN WITH 1/8" GAPS BETWEEN. FOR 2 FITS, INSTALL 2 DROPOUTS, PC17, WITH 1/8" BETWEEN.



CHANNEL RUBBER (SEE BONDING NOTES)



SECTION A-A



PC NO.	ELBOW							COVER							TYPE
	A	B	C	F	G	K	PC NO.	D	E	H	J	K			
1	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	90° OUTSIDE		
2	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	2	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	90° INSIDE		
3	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	3	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	90° FLAT		
4	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	4	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	90° FLAT		
5	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	5	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	90° FLAT		
6	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	6	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	90° FLAT		
7	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	7	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	90° FLAT		
8	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	8	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	90° FLAT		
9	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	9	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	90° FLAT		
10	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	10	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	90° FLAT		
11	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	11	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	90° FLAT		
12	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	12	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	90° FLAT		
13	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	13	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	90° FLAT		
14	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	14	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	90° FLAT		
15	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	15	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	90° FLAT		
16	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	16	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	90° FLAT		
17	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	17	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	90° FLAT		
18	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	18	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	90° FLAT		
19	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	19	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	90° FLAT		
20	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	20	1-1/8"	1-1/8"	1-1/8"	1-1/8"	1-1/8"	90° FLAT		

THESE 90° ELBOWS ARE TO BE CUT TO OBTAIN ELBOWS OF LESSER DEGREES

SH 132317216

FIGURE 4A13. External wireways installation standard methods (submarines).

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- NOTES:
1. WHERE CABLES ENTER PROPELLION ELECTRICAL EQUIPMENT, CARE SHALL BE EXERCISED TO AVOID BUNCHING OR CLOSELY GROUPING THE CABLES IN ANY MANNER THAT MAY RESTRICT DISSIPATION OF HEAT FROM THE CABLES.
 2. PHASE ARRANGEMENTS AS SHOWN IN CHART ON THIS FIGURE SHALL APPLY TO HORIZONTAL, VERTICAL OR INCLINED WIREWAY RUNS. ANY ARRANGEMENTS OF CABLES OTHER THAN SHOWN MUST BE SPECIFICALLY APPROVED BY NAVSEA.
 3. PROPELLION CABLES IN WIREWAYS SHALL BE RUN SEPARATE FROM OTHER CABLES.
 4. CABLE ENDS SHALL BE WATER-SEALED BY TERMINATING IN WATER-SEAL SOLDERLESS LUGS IN ACCORDANCE WITH MIL-STD-88-1 GROUP A.
 5. WHERE CABLES TO PROPELLION EQUIPMENT ARE REQUIRED TO ENTER THROUGH STUFFING TUBES, THEY SHALL BE INSTALLED IN ACCORDANCE WITH MIL-STD-99-3.
 6. IN ORDER TO INSURE THAT THE PROPER ARRANGEMENT OF SINGLE CONDUCTOR CABLES IS MAINTAINED, THE PHASE OF SINGLE CONDUCTOR CABLES SHALL BE INDICATED (IN ACCORDANCE WITH SECTION 304 OF THE GENERAL SPECIFICATIONS FOR SHIPS) AT SUITABLE INTERVALS ALONG THE LENGTH OF EACH CABLE AND AT THE EXTREMITIES.
 7. UNLESS OTHERWISE APPROVED NO CABLE SUPPORT SHALL BE MOUNTED IN SUCH A MANNER AS TO BE DIRECTLY CONNECTED TO STRENGTH FRAMES OR BEAMS, PARTICULARLY WHERE NEAR THE SKIN OF THE SHIP AND AT OR BELOW THE WATERLINE.
 8. AVOID RUNNING PROPELLION CABLE WIREWAYS IN LOCATIONS WHERE AMBIENT TEMPERATURES EXCEED 50°C. DURING OPERATION.
 9. HANGERS SHALL BE SPACED AT INTERVALS OF NOT MORE THAN 16" O.C.
 10. MINIMUM CLEARANCE BETWEEN CABLES AND BULKHEADS SHALL BE 4 INCHES.
 11. THIS FIGURE SUPERSEDES SHEET 4B1 OF DRAWING 803-500 027 AND SECTION 2, SHEET 131, OF DRAWING NAVSEC NO. 9000-58202-73980.

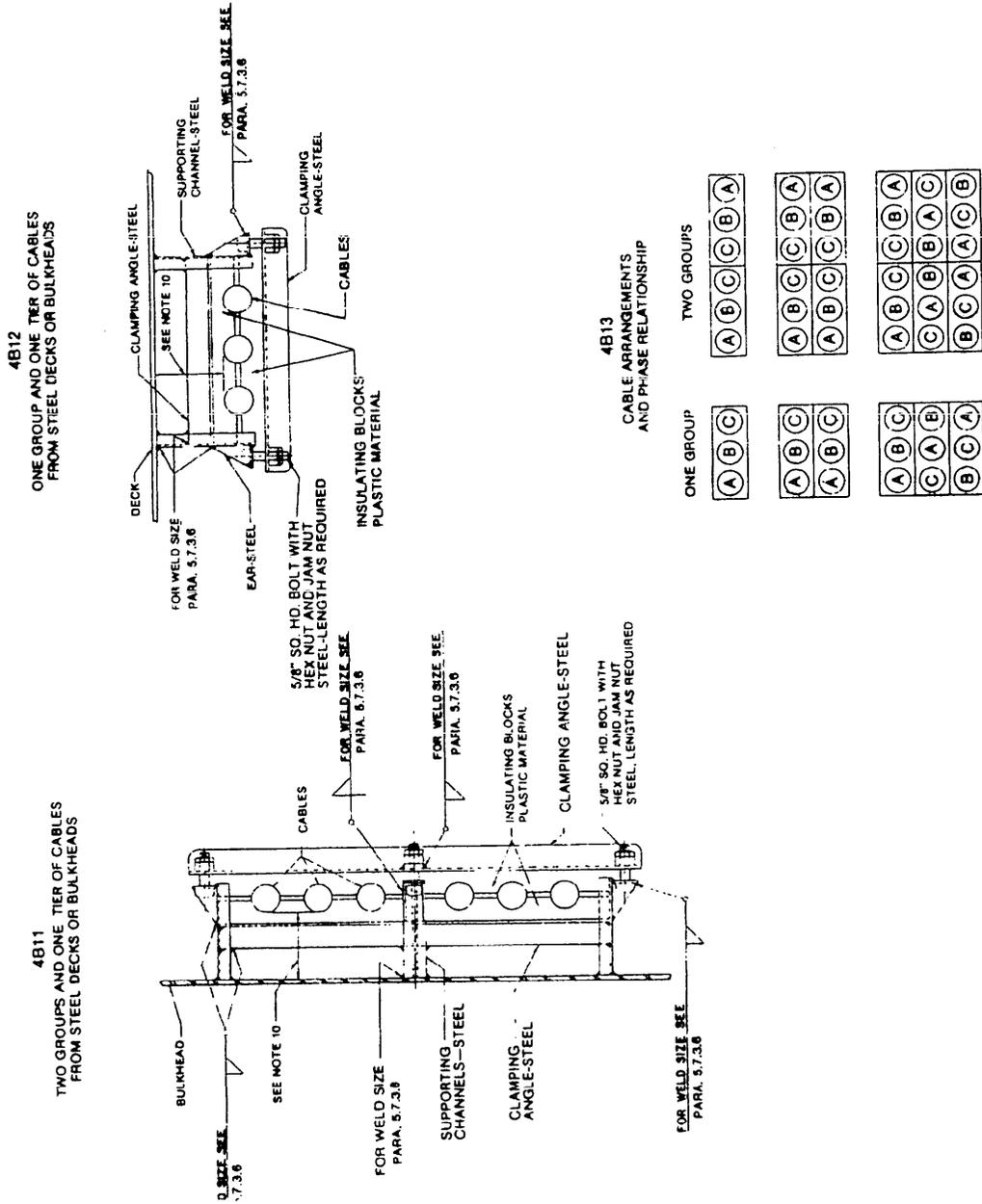


FIGURE 4B1. Cableways for A.C. propulsion cables (surface ship).

SH 132317218

DOD-STD-2003-4 (NAVY)
24 JUNE 1987

NOTE:
1. THIS FIGURE SUPERCEDES SHEET 4B2 OF DRAWING 903-9001027
AND SECTION 2 SHEET 132 OF DRAWING NAVSEC NO.
9002-86702-7-3860.

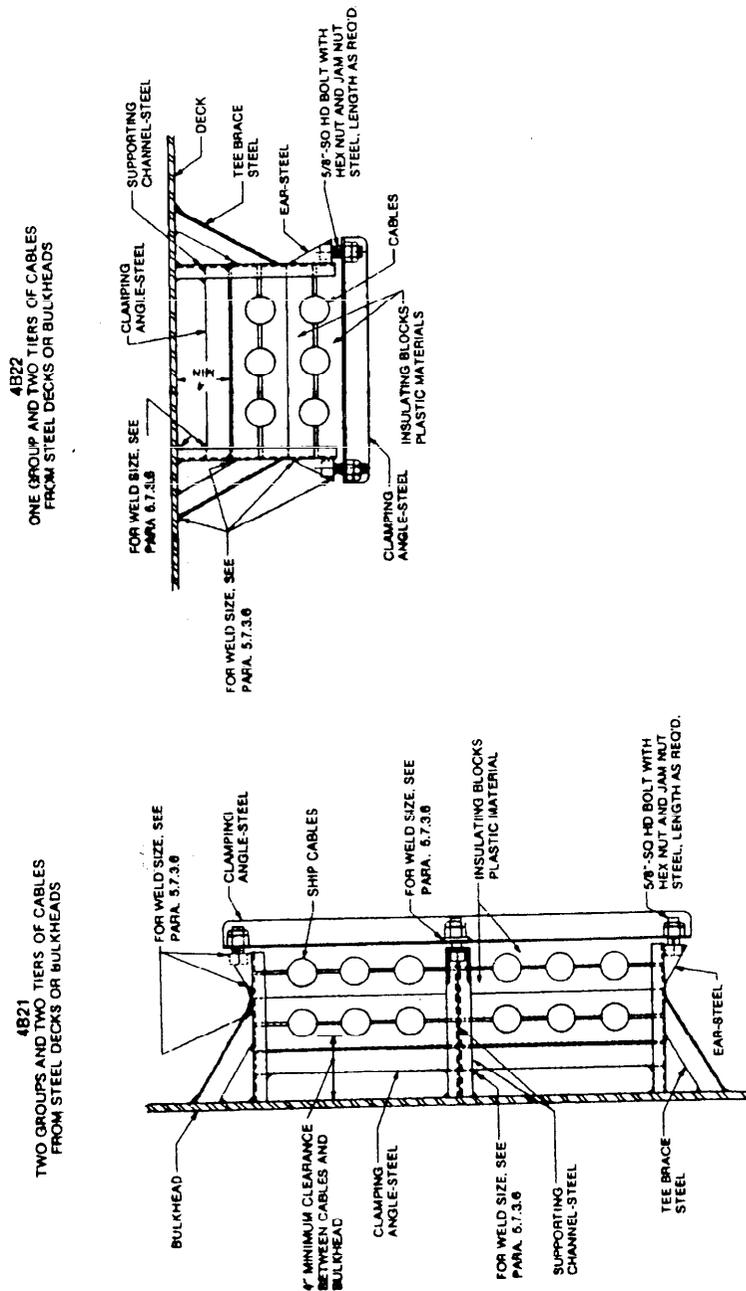
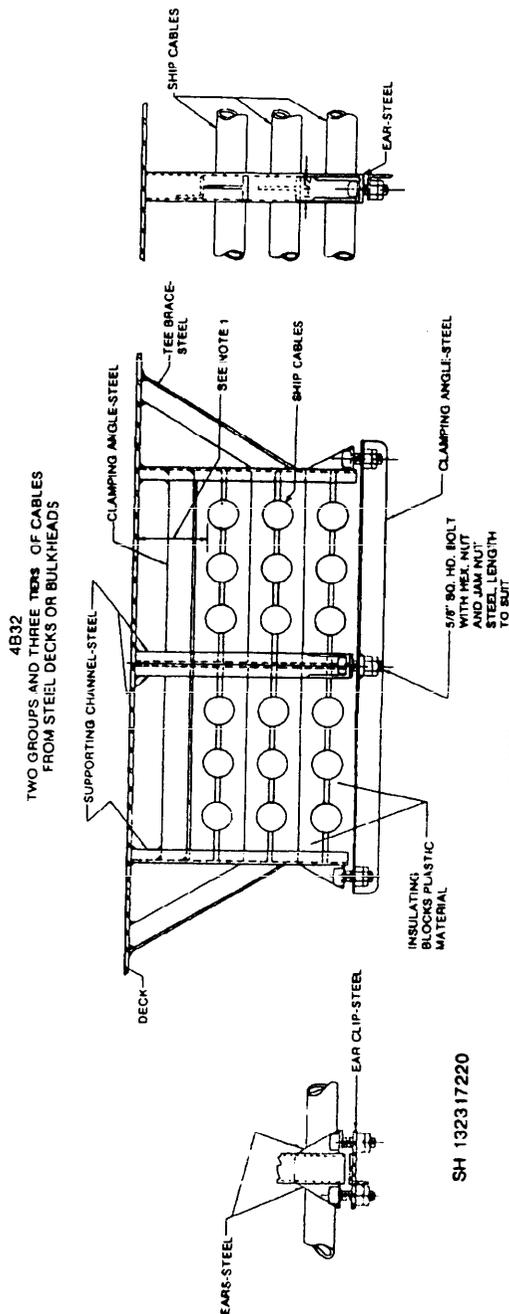
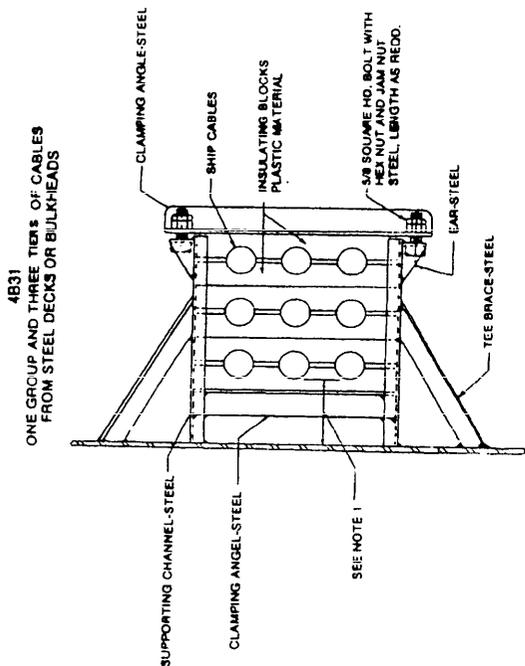


FIGURE 4B2. Cableways for A.C. propulsion cables (surface ship).

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24 JUNE 1987

NOTE:
1. MINIMUM CLEARANCE BETWEEN CABLES AND BULKHEADS/DECK'S SHALL BE 4 INCHES.
2. ALL WELDING SHALL BE AS PER PARA. 5.7.3.6
3. THIS FIGURE SUPERSEDES SHT. 4B3 OF DRAWING 809-5001027 AND SECTION 2, SHEET 133 OF DRAWING NAVSEC NO. 9000-S6202-73960



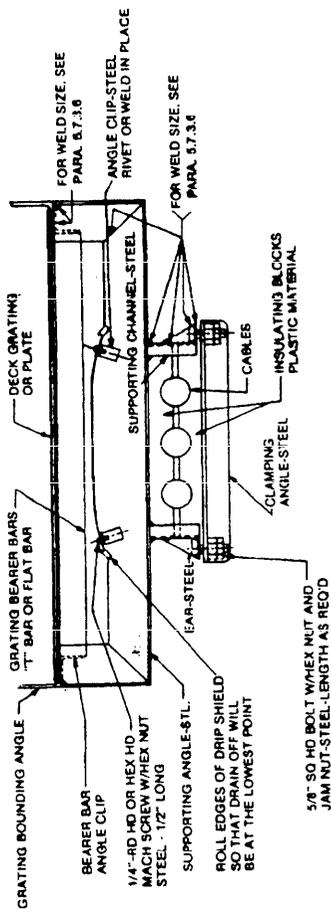
SH 132317220

FIGURE 4B3. Cableways for A.C. propulsion cables (surface ships).

DOD-STD-2003-4 (NAVY)
24 JUNE 1987

NOTE:
1. THIS FIGURE SUPERSEDES SHIT 4B4 OF DRAWING 803-5001027 AND SECTION 2, SHEET 134, OF DRAWING NAVSEC NO. 9000-56202-73186.

4B41
ONE GROUP AND ONE TIER OF CABLES
UNDER DECK GRATINGS



4B42
TWO GROUPS AND ONE TIER OF CABLE
UNDER DECK GRATINGS

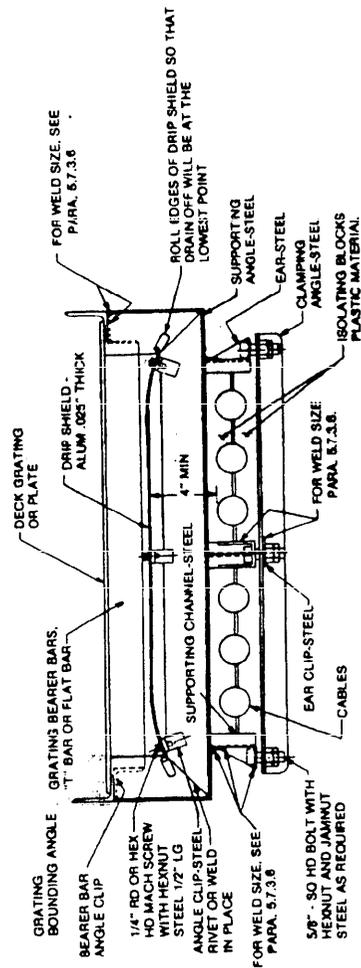


FIGURE 4B4. Support for A.C. propulsion cables (surface ships).

#H 132317221

DOD-STD-2003-4 (NAVY)
24 JUNE 1987

- NOTES:
1. ROLL EDGES OF DRIP SHIELD SO THAT DRAIN OFF WILL BE AT LOWEST POINT.
 2. THIS FIGURE SUPERSEDES SHEET 485 OF DRAWING 801-5001027 AND SECTION 2, SHEET 131 OF DR. DRAWING, NAVSEC NO. 8000-88202-73980.

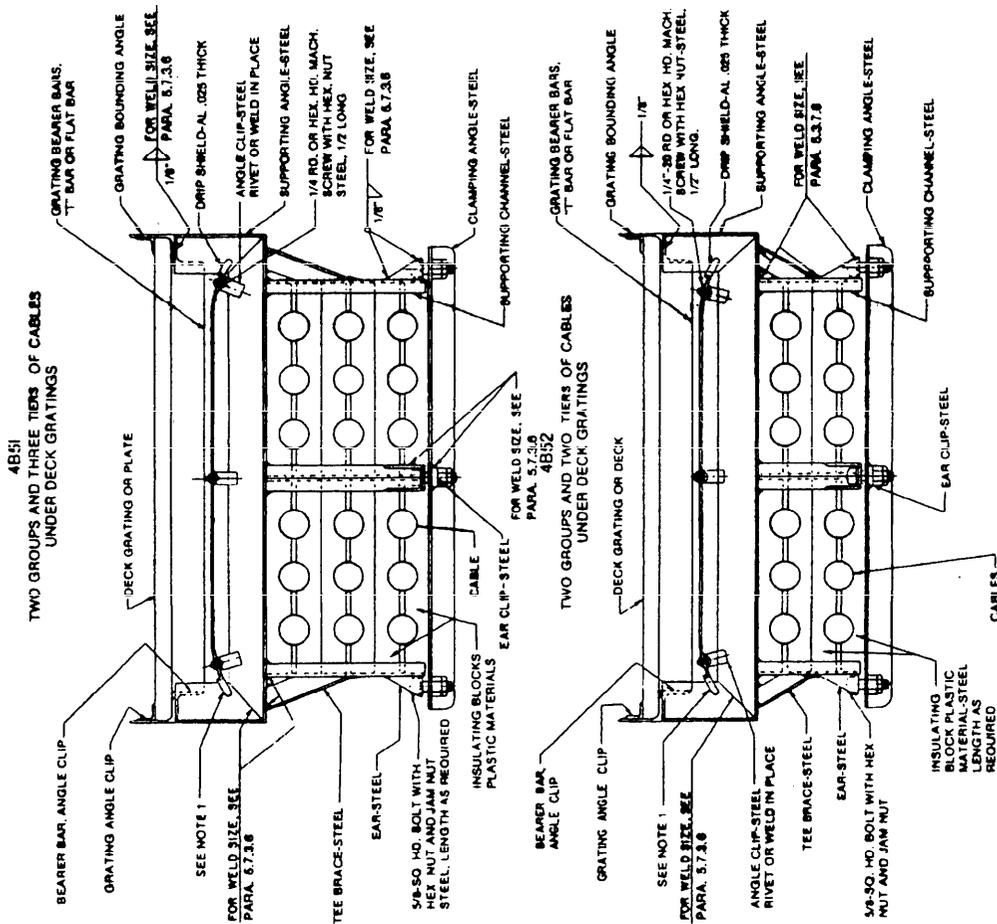


FIGURE 4B51. Cableways for A.C. propulsion cables (surface ships).

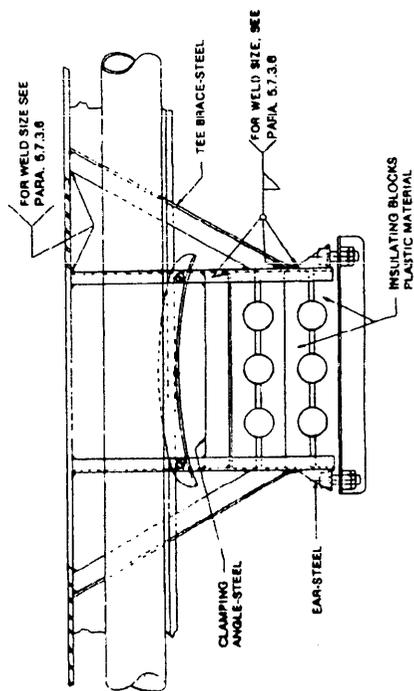
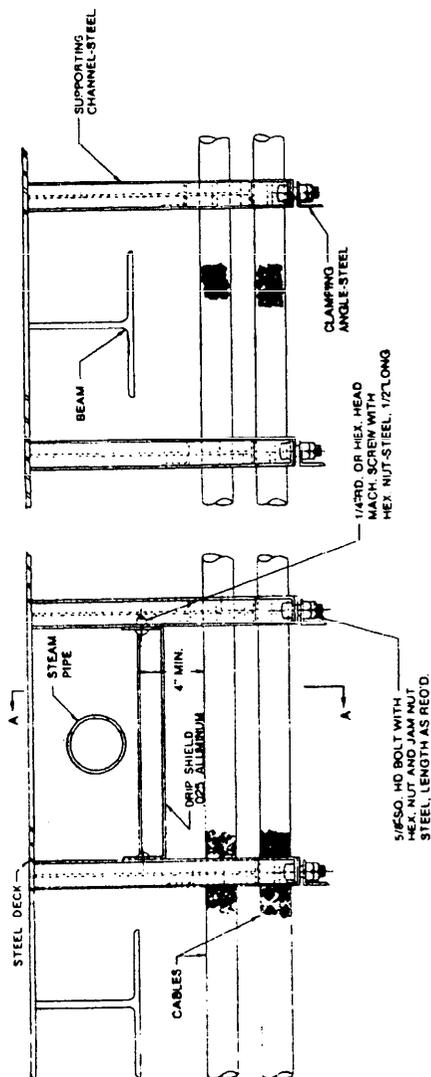
SH 132317222

DOD-STD-2003-4 (NAVY)
24 JUNE 1987

NOTE:
1 THIS FIGURE SUPERSEDES SHEET 486 OF DRAWING 803-5001027
AND SECTION, SHEET 134, OF DRAWING, NAVSEC NO.
800-58202-73980

4B61

CABLE RUNS ACROSS STEEL BEAMS
SHOWING DRIP SHIELD UNDER STEAM PIPE



SECTION A-A

FIGURE 4B6. Cableways for A.C. propulsion cables (surface ships).

SH 132317223

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24 JUNE 1987

NOTE:
1. FILL SPACE BETWEEN CHANNEL AND BRIDGE ANGLE WITH PLASTIC SEALER . MIL-I-3084, TYPE HF
2. THIS FIGURE SUPERSEDES SHEET 487 OF DWG. 803-5001027 AND SECTION 2, SHEET 137 OF DRAWING, NAVSEC NO 9000-86202-73980

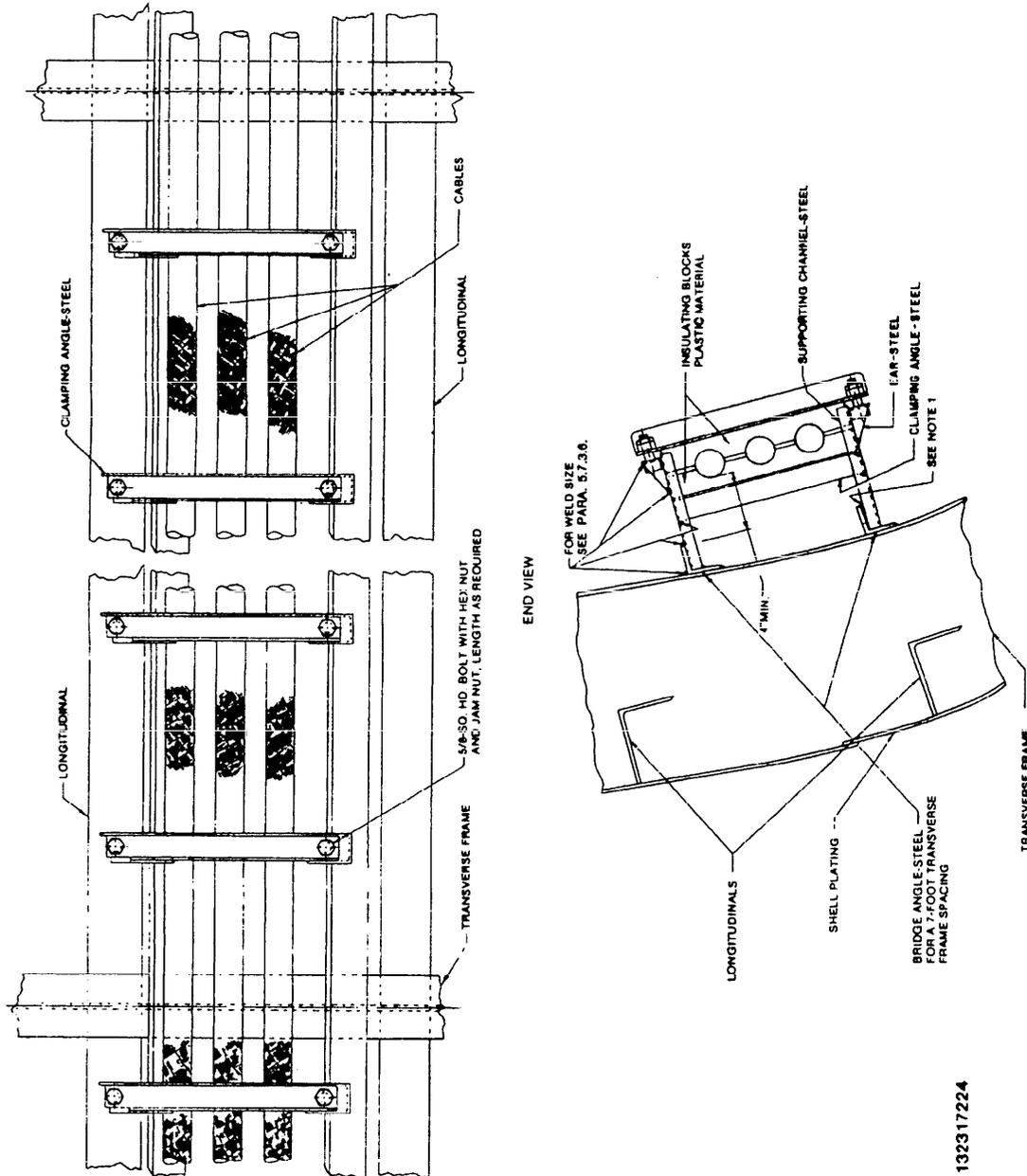


FIGURE 4B7. Cableways for A.C. propulsion cables (surface ships).

H 132317224

DOD-STD-2003-4 (NAVY)
24 JUNE 1987

NOTES:
1 THIS FIGURE SUPERSEDES SHEET 488 OF DRAWING
803-500 027 AND SECTION 4, SHEET 51, OF DRAWING
NAVSEC NO. 8000-SR:02-73800.

4881

PASSING CABLES
THROUGH STEEL BULKHEADS OR DECK
USING PLATE WITH STUFFING TUBES - INTEGRALLY CAST

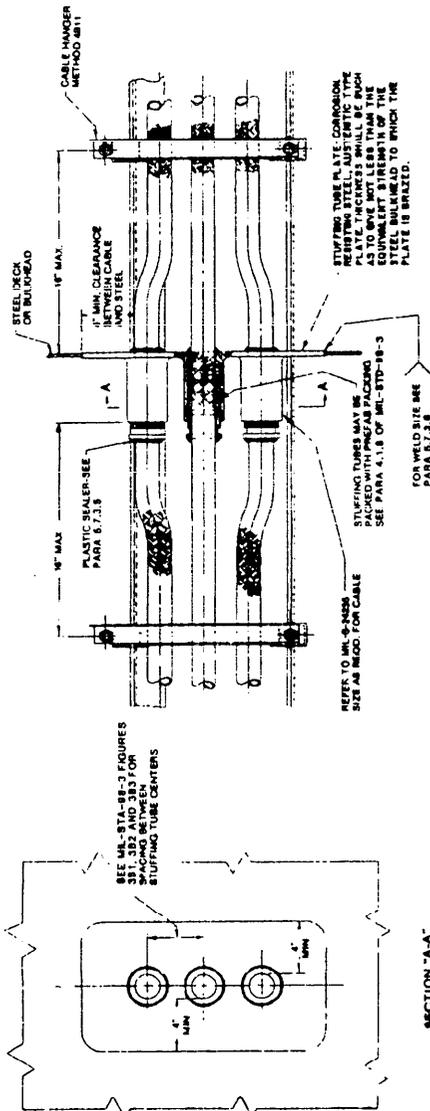


FIGURE 4B8. Cabways for A.C. propulsion cables (surface ships).

SH 132317225

DOD-STD-2003-4 (NAVY)
24 JUNE 1987

NOTES:
1. THIS FIGURE SUPERSEDES SHEET 4B9 OF DRAWING
903-5001027 AND SECTION 4, SHEET 52, OF DRAWING
NAVSEC NO. 9000-56202 73910.

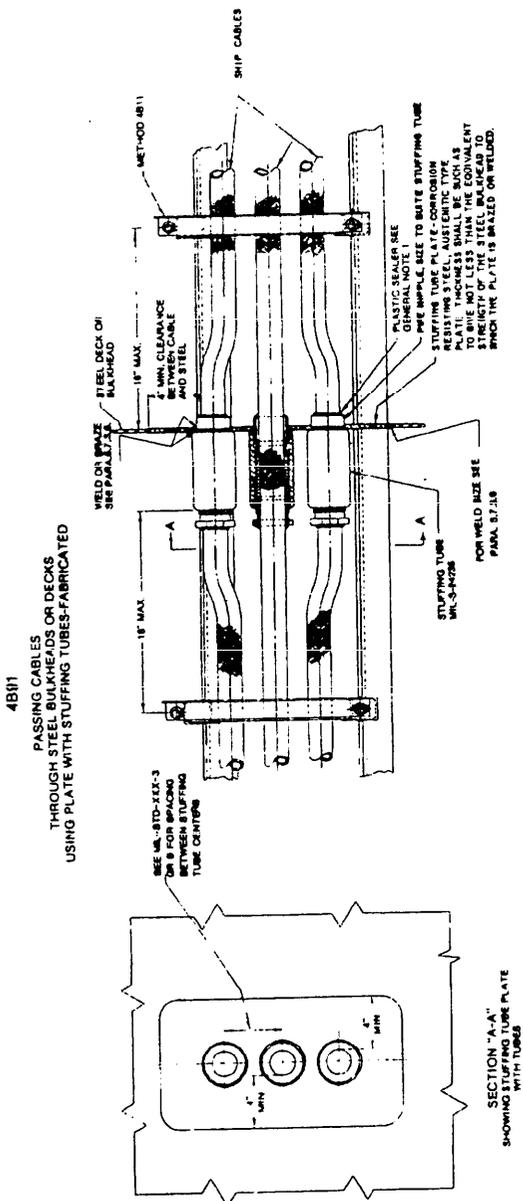


FIGURE 4B9. Cableways for A.C. propulsion cables (surface ships).

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DOD-STD-2003-4 (NAVY) 24 JUNE 1987

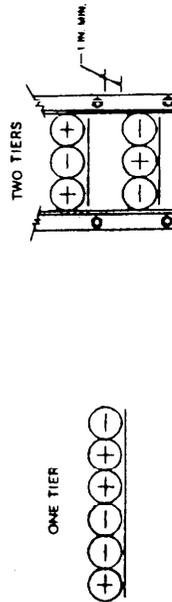
NOTES:

1. THE METHODS SHOWN INDICATE THE RECOMMENDED ARRANGEMENTS OF DIRECT CURRENT SINGLE CONDUCTOR PROPULSION CABLES IN ENCLOSURE DUCTS. THE METHODS SHOWN ARE BASED ON THE PROVISION OF ONE CABLE PER LEG. THE ARRANGEMENT OF CABLES ON ONE CABLE, CONSISTING OF A POSITIVE AND A NEGATIVE LEG, EACH LEG CONTAINING TWO OR MORE CABLES, SHOULD BE USED ONLY WHEN THE NUMBER OF CABLES PER LEG IS GREATER THAN TWO. EACH CABLE SHOULD CONTAIN AN EVEN NUMBER OF SINGLE CONDUCTOR CABLES PER LEG IN PREFERENCE TO AN ODD NUMBER PER LEG.
2. THE ARRANGEMENTS APPLY TO HORIZONTAL, VERTICAL OR INCLINED WIRERAYS. WHEN SEVERAL PROPULSION CIRCUITS ARE INSTALLED IN ONE WIRERAY, EACH CIRCUIT SHOULD BE ARRANGED AS INDICATED IN THIS FIGURE. THE CABLES ON EACH HANGER OR HANGERS ON SEPARATE OR SEPARATED ON INDIVIDUAL HANGERS.
3. THE EXTERNAL MAGNETIC FIELDS DUE TO DIRECT CURRENT IN DOUBLE CONDUCTOR CABLES ARE RELATIVELY SMALL IF THE TWO CABLES OF A CIRCUIT ARE PLACED CLOSE TOGETHER. THE CURRENTS OF OPPOSITE POLARITY ACCORDINGLY, WHEN SEVERAL DOUBLE CONDUCTOR CABLES ARE USED IN PARALLEL, THE TWO CONDUCTORS IN EACH CABLE SHOULD BE PLACED CLOSE TOGETHER.
4. CABLE CONNECTIONS TO THE TERMINALS OF ELECTRICAL EQUIPMENT SHOULD BE ACCOMPLISHED WITH A MINIMUM AMOUNT OF FANNING OF THE INDIVIDUAL CONDUCTORS. LOOPS FORMED BY INDIVIDUAL CONDUCTORS SHOULD BE KEPT TO A MINIMUM AND AVOIDED WHEREVER POSSIBLE. WHEN UNAVOIDABLE, THE PLANE OF THE LOOP FORMED BY THE CONDUCTORS OF OPPOSITE POLARITY SHOULD BE VERTICAL. EACH CIRCUIT SHOULD BE VERTICAL IN PREFERENCE TO HORIZONTAL.
5. IN ORDER TO INSURE THAT THE PROPER ARRANGEMENT OF SINGLE CONDUCTOR CABLES IS MAINTAINED, THE POSITIVITY OF SINGLE CONDUCTOR CABLES SHOULD BE IDENTIFIED BY MARKINGS ALONG THE LENGTH OF EACH CABLE AND AT THE EXTREMITIES.
6. PROPULSION CABLES IN WIRERAYS SHALL RUN SEPARATE FROM OTHER CABLES WHERE PRACTICABLE.
7. PROPULSION CABLES SHALL BE SECURELY CLAMPED TO AVOID LOSING CONTACT. PROTECTIVE COVERING SHALL BE USED TO AVOID MAGNETIC STRESSES.
8. AVOID RUNNING PROPULSION CABLES WHEREVER IN LOCATION WHICH MAY BE SUBJECT TO VIBRATION OR OPERATION, AS IN THE CASE OF MACHINES, EXHAUSTERS, PUMPS, ETC.
9. WHERE CABLES ENTER PROPULSION ELECTRICAL EQUIPMENT, CARE SHALL BE EXERCISED TO AVOID BUMPING OR GLOBEY GROUPING THE CABLES IN ANY MANNER THAT MAY RESTRICT DISSIPATION OF HEAT FROM THE CABLES.
10. THE ENDS OF PROPULSION CABLES SHALL BE ADEQUATELY SEALED BY APPROVED METHODS TO AVOID THE ENTRANCE OF WATER OR MOISTURE WHICH IS NOT SPECIFICALLY COVERED IN D.C. PROPULSION METHODS SHALL BE IN ACCORDANCE WITH THE APPLICABLE STANDARD METHODS.
12. THE FIGURE NUMBERED SHEET 4B10 OF DRAWING 800-8001087-140 SECTION 2, SHEET 12, OF DRAWING NAVSPEC NO. 8000-80202-7300

4B101
ARRANGEMENTS FOR TWO SINGLE CONDUCTOR
CABLES PER LEG



4B102
ARRANGEMENTS FOR THREE SINGLE CONDUCTOR
CABLES PER LEG



NO. OF HANGERS HORIZONTAL OR VERTICAL	MAXIMUM ALLOWABLE CURRENT CAPACITIES FOR D.C. PROPULSION CABLES IN WIRERAYS AND RACES					
	INDIVIDUAL CABLES ON EACH HANGER LOCATED ADJACENT WITHOUT SPACING		INDIVIDUAL CABLES ON EACH HANGER SPACED 1/2 APART		INDIVIDUAL CABLES ON EACH HANGER SPACED 1/4 APART	
	CABLES IN HORIZONTAL HANGERS LOCATED ADJACENT WITHOUT SPACING	CABLES IN HORIZONTAL HANGERS LOCATED ADJACENT WITHOUT SPACING	CABLES IN HORIZONTAL HANGERS LOCATED ADJACENT WITHOUT SPACING	CABLES IN HORIZONTAL HANGERS LOCATED ADJACENT WITHOUT SPACING	CABLES IN HORIZONTAL HANGERS LOCATED ADJACENT WITHOUT SPACING	CABLES IN HORIZONTAL HANGERS LOCATED ADJACENT WITHOUT SPACING
1**	80	80	80	80	80	80
2**	40	40	40	40	40	40
3**	27	27	27	27	27	27

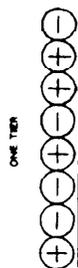
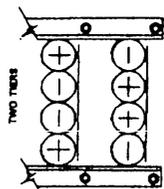
FIGURE 4B10 Cableways for D.C. propulsion (surface ships).

SH 132317227

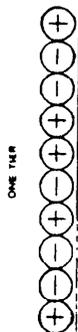
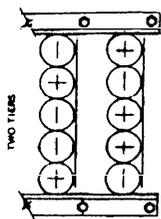
DOD-STD-2003-4 (NAVY)
24 JUNE 1987

NOTES:
1. MAINTAIN A MINIMUM OF 1 IN. BETWEEN THE ROW OF CABLES AND THE ABOVE OR ADJACENT STRUCTURE.
2. THIS FIGURE SUPERSEDES SHEET 4B111 OF DRAWING 903-6001027 AND SECTION 2, SHEET 130, OF DRAWING NAVSEC NO. 9000-S6202-73960.

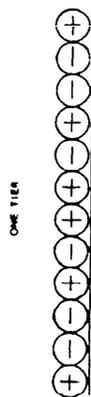
4B111
ARRANGEMENTS FOR FOUR SINGLE CONDUCTOR CABLES PER LEG



4B112
ARRANGEMENTS FOR FIVE SINGLE CONDUCTOR CABLES PER LEG

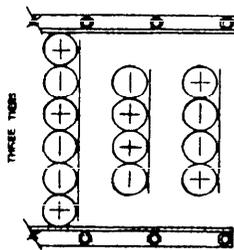
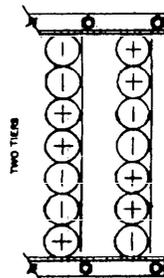


4B113
ARRANGEMENTS FOR SIX SINGLE CONDUCTOR CABLES PER LEG



4B114

ARRANGEMENTS FOR SEVEN SINGLE CONDUCTOR CABLES PER LEG



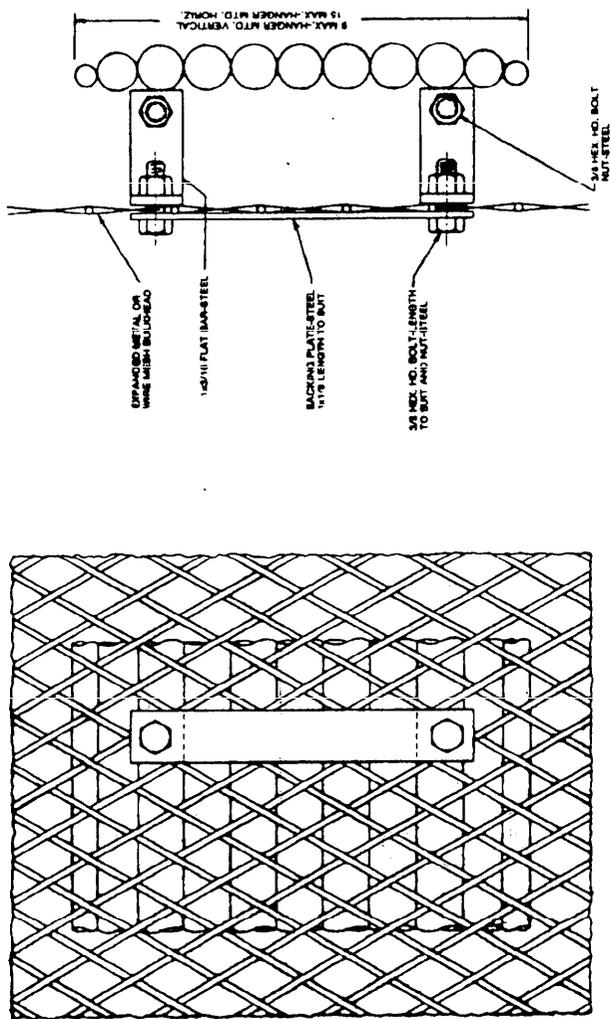
H 132317228

FIGURE 4B11. Cableways for D.C. propulsion cables (surface ships).

DOD-STD-2003-4 (NAVY)
24 JUNE 1987

NOTES:
1. THIS FIGURE SUPERSEDES SHEET 4B12 OF DRAWING
803-5001027 AND SECTION 2, SHEET 177, OF DRAWING
NAVSEC NO. 9000-58202-73980.

4B121
EXPANDED METAL OR WIRE MESH BULKHEADS



SH 132317229

FIGURE 4B12. Single cableway on non structural bulkhead (surface ships).

DOD-STD-2003-4 (NAVY)
24 JUNE 1987

NOTES:
1. THIS FIGURE SUPERSEDES SHEET 4B13 OF DRAWING 803-5001027 AND SECTION 2, SHEET 113, OF DRAWING NAVSEC NO. 9000-56102-71590.

4B131

WATERTIGHT DECK OR BULKHEAD WITH INSULATION AND SHEATHING CABLES SECURED TO STUD PADS OR TAP PADS

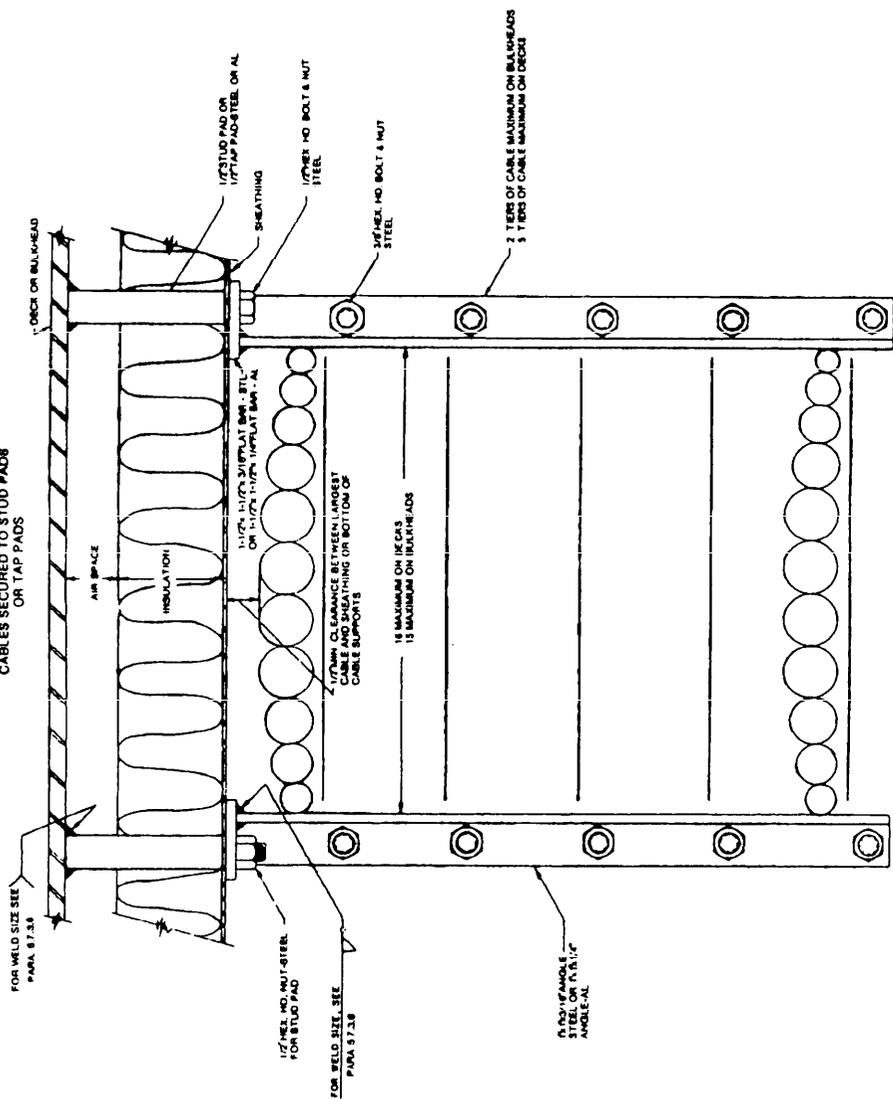


FIGURE 4B13. Cableways in acoustical locations (surface ships).

SH 132317230

DOD-STD-2003-4 (NAVY)
24 JUNE 1987

NOTES:
1. THIS FIGURE SUPERSEDES SHEET 4B14 OF DRAWING
1003-5001027 AND SECTION 2, SHEET 111, OF DRAWING
NAVSEC NO. 8000-86202-73990.

4B141

TWO BANKS OF CABLES ON WATERTIGHT BULKHEADS
WITH INSULATION AND SHEATHING
CABLE RACKS SECURED WITH BOLTS IN TAPPED PADS
OR WITH NUTS ON STUD PADS

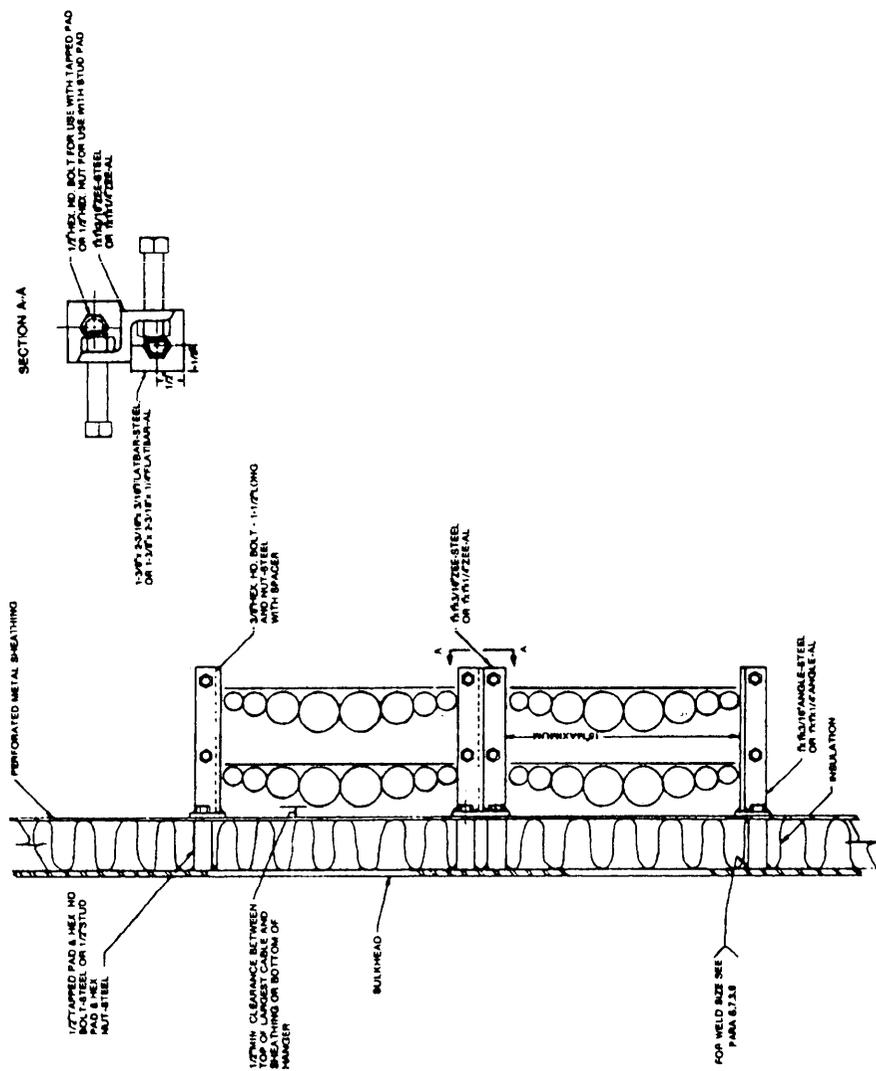
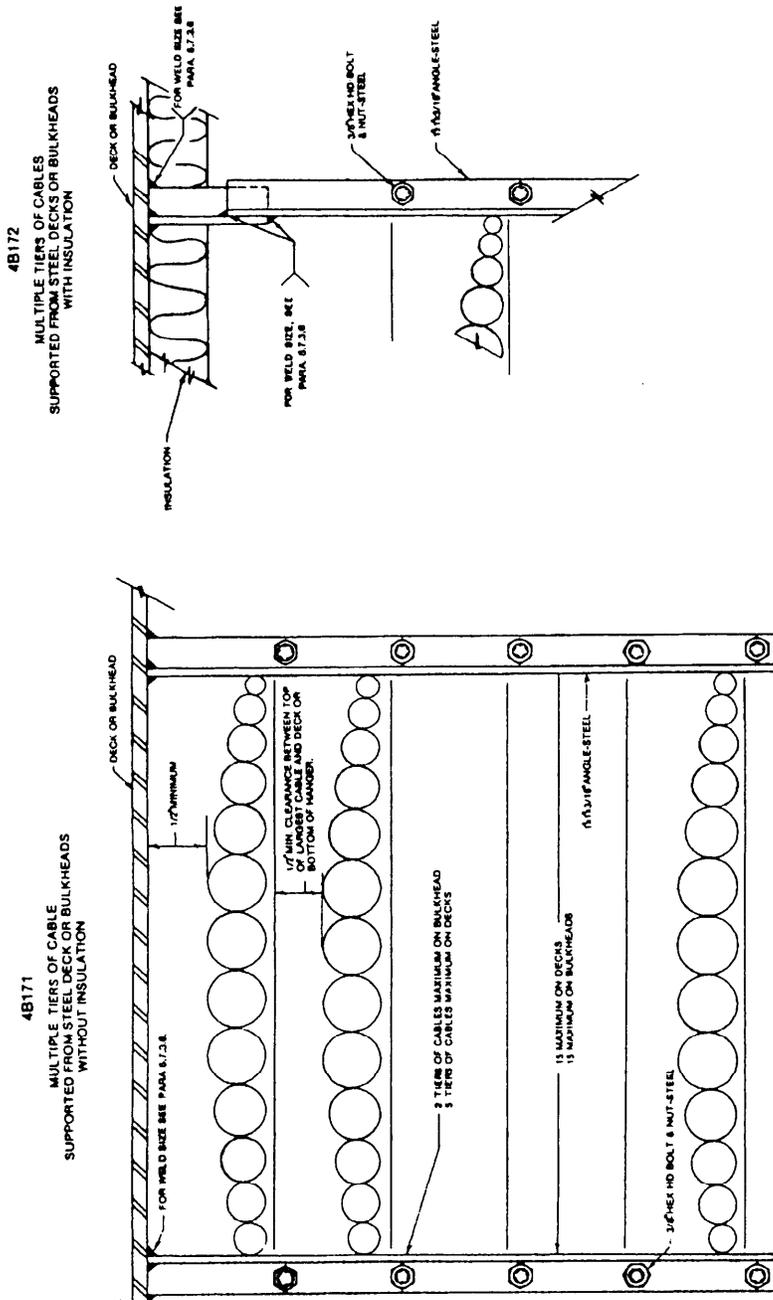


FIGURE 4B14. Cableways in acoustical locations (surface ships).

SH 132317231

DOD-STD-2003-4 (NAVY)
24 JUNE 1987

NOTES:
1. THIS FIGURE SUPERSEDES SHEET 4B17 OF DWG
803-5001027 AND SECTION 2, SHEET 213 OF DRAWING
NAVSEC NO. 8000-58207-73960



SH 132317234

FIGURE 4B17. Multiple cables on steel decks or bulkheads.

DOD-STD-2003-4 (NAVY)

24 JUNE 1987

- NOTES:
1. ALL WELDING SHALL BE IN ACCORDANCE WITH PARA. 57.3.6.
 2. THIS FIGURE SUPERSEDES SHEET 4B18 OF DRAWING 803-500 027 AND SECTION 2, SHEET 217 OF DRAWING NAVSEC NO. 9000-96202-73980.

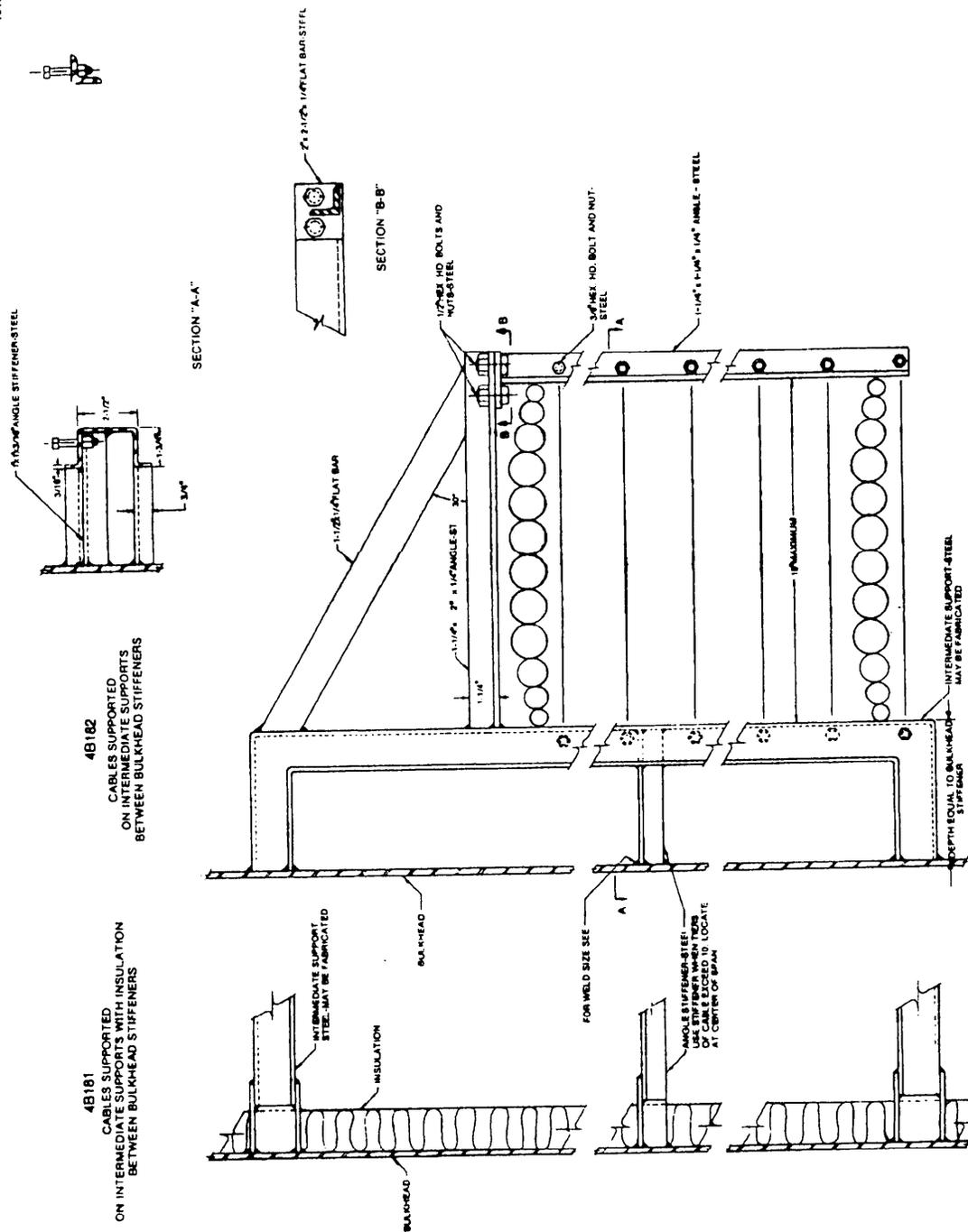


FIGURE 4B18. Multiple cables on steel bulkheads (surface ships).

SH 132317235

DOD-STD-2003-4 (NAVY)
24 JUNE 1987

- NOTES
- THREE ROWS MAY BE USED IN CONGESTED LOCATIONS ON REQUEST AND SUBJECT TO SPECIFIC APPROVAL.
 - THIS FIGURE SUPERSEDES SHEET 4B20 OF DRAWING 803-5001027 AND SECTION 2, SHEET 214, OF DRAWING NAVSEC NO. 9000-S6202-73980.

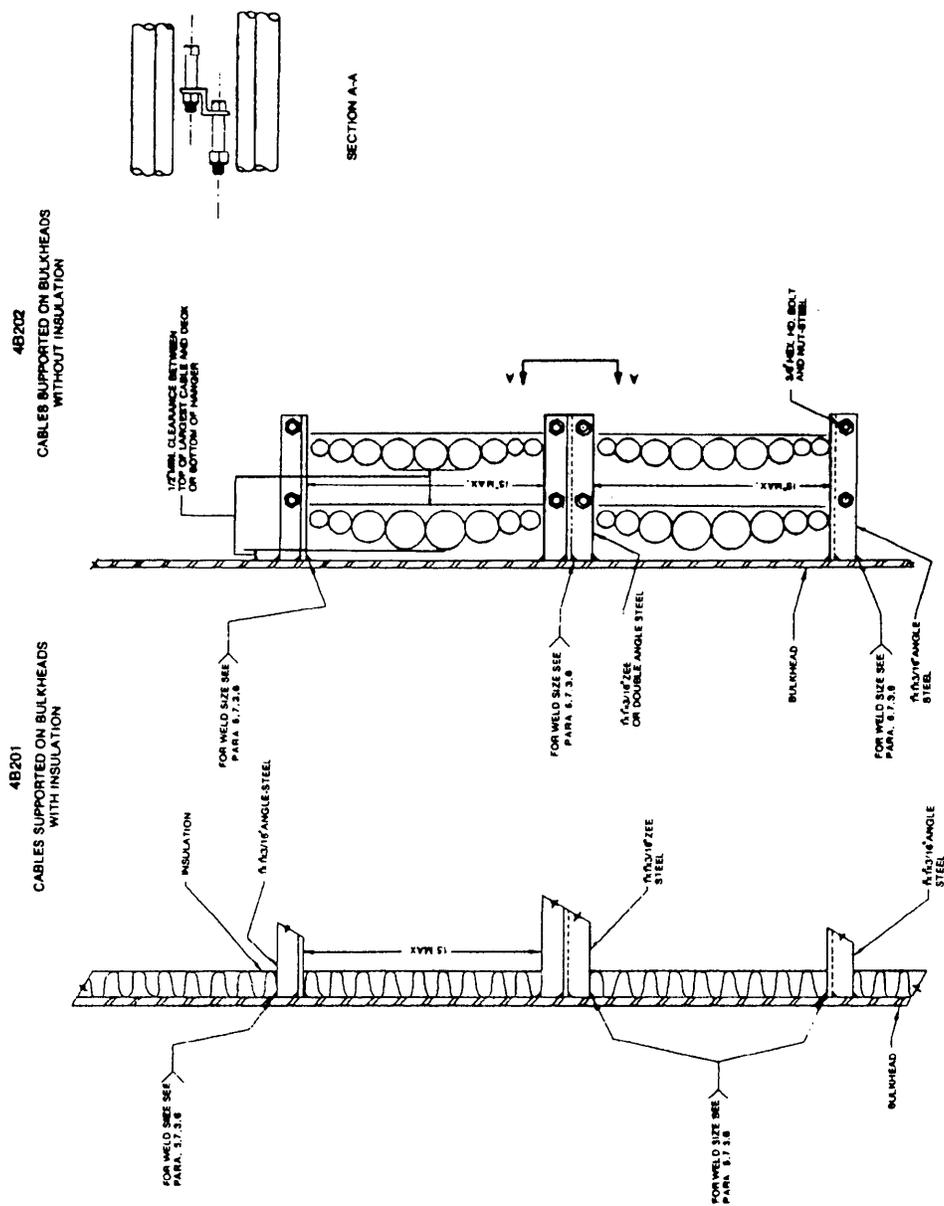


FIGURE 4B20. Multiple cables on steel bulkheads (surface ships).

SH 132317237

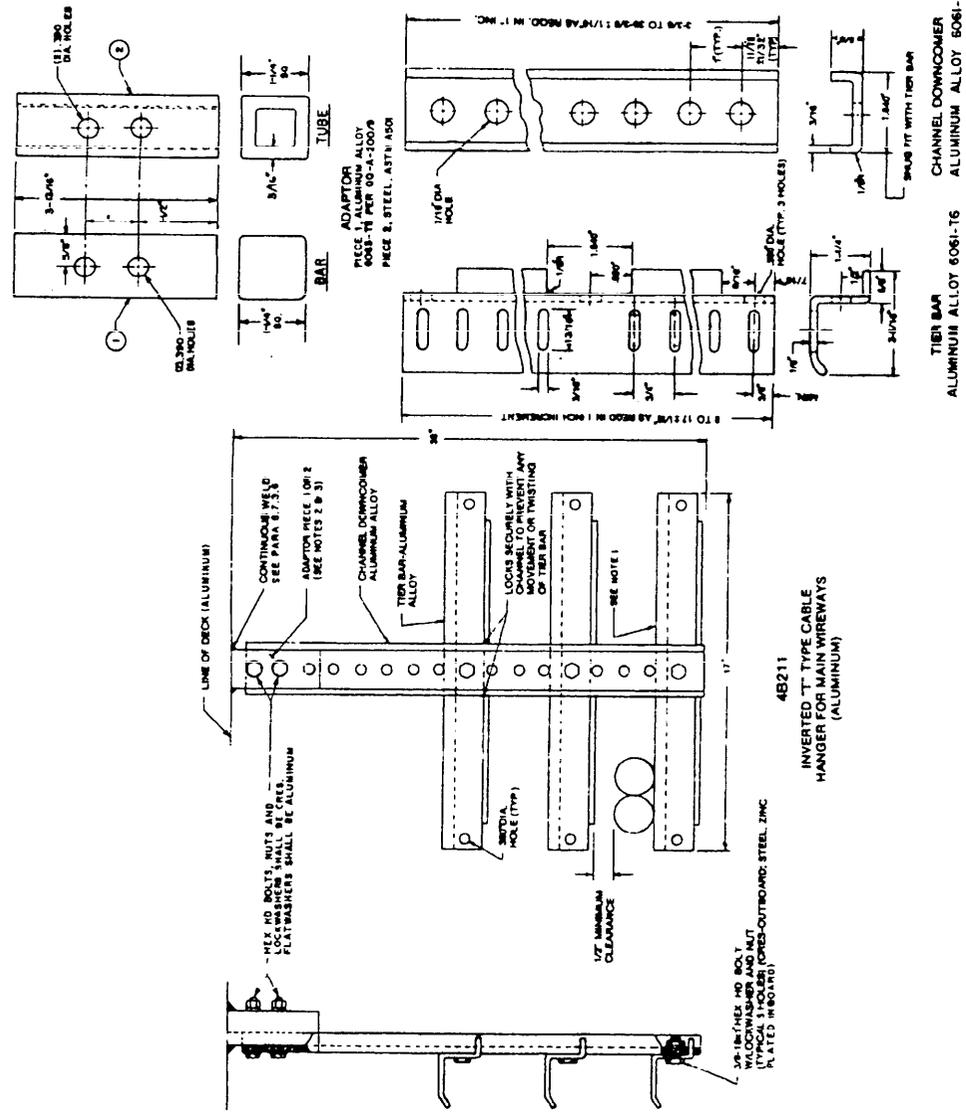
NOTES:

1. SPACING, NUMBER OF TIERS, AND CABLE WEIGHT SHALL NOT EXCEED THE VALUES SPECIFIED BELOW. DOWNTOWARD EXTENSION TO THE LESSER CONDITION OF FEWER TIERS FOR HANGER ASSY'S (WITH CABLE LOAD NOT EXCEEDING THE MAXIMUM PER TIER AS SPECIFIED BELOW) IS ACCEPTABLE.

CABLE TYPE	MAX. NO. OF TIERS	MAX. CABLE WT. (LBS.)
FOR ASST.	16	3
HORIZONTAL DECK	36	15.5

2. ADAPTOR, PC 1 USED TO MAINTAIN SIMILAR METAL COMPATIBILITY FOR WELDING TO SHIP'S ALUM. STRUCTURE
3. FOR MOUNTING ALUMINUM HANGERS ON STEEL DECKS AND BULKHEADS, USE ADAPTOR PC 2 STEEL A317M A501. CONTACT AREAS BETWEEN ADAPTOR, DOWNCOMER AND ATTACHING BOLTS SHALL BE PAINTED WITH TWO COATS OF ZINC CHROMATE PRIMER
4. SHARP CORNERS SHALL BE SLIGHTLY ROUNDED. ALL PARTS SHALL HAVE SMOOTH SURFACES.
5. DELETED
6. FOR SPACING OF HANGERS SEE FIGURE 4855.
7. SEE 4C22 & 4C23 FOR INSTALLATION OF BANDING STRAPS.
8. THIS FIGURE SUPERSEDES SHEET 4821 OF DRAWING 803-500 1027 AND SECTION 2, SHEET 223, OF DRAWING NAVSEC NO. 9000-90202-13980.

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24 JUNE 1987



48211
INVERTED T-TYPE CABLE HANGER FOR MAIN WIREWAYS (ALUMINUM)

TIER BAR
ALUMINUM ALLOY 6061-T6

CHANNEL DOWNCOMER
ALUMINUM ALLOY 6061-T6

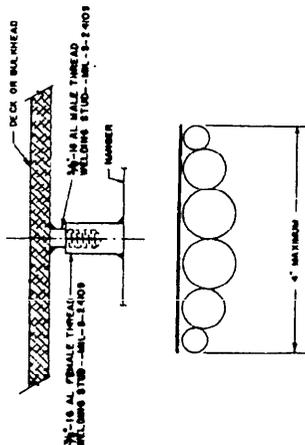
FIGURE 4B21. Multiple cableways support from aluminum or steel decks & bulkheads (surface ships).

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NOTES:
1. METHODS SHOWN ON THIS FIGURE MAY BE USED IN LIEU OF THOSE SHOWN ON FIGURE 4B24.
2. THIS FIGURE SUPERSEDES SHEET 4B23 OF DRAWING 800-600 1027 AND SECTION 2, SHEET 201, OF DRAWING, NAVSEC NO. 9000-86002-73960.

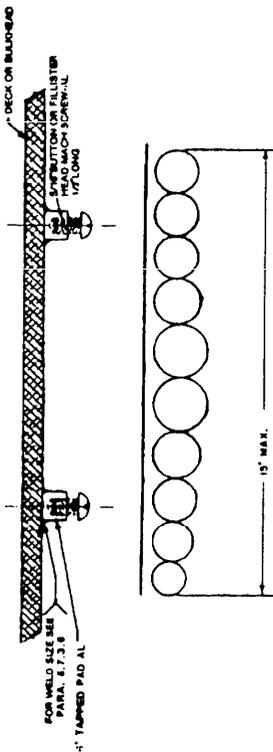
4B233

SINGLE TIER SECURED WITH A SINGLE WELD STUD ON ALUMINUM DECKS AND BULKHEADS
MAXIMUM CABLE WEIGHT 3 POUNDS PER SUPPORT



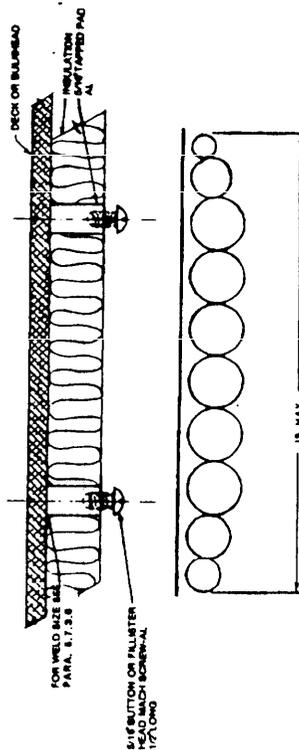
4B231

SINGLE TIER SECURED WITH TAPPED PADS ON ALUMINUM DECKS AND BULKHEADS



4B232

SINGLE TIER SECURED WITH TAPPED PADS ON INSULATED ALUMINUM DECKS AND BULKHEADS



SH 132317240

FIGURE 4B23. Single cableway or aluminum structures (surface ships).

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- NOTES:
1. THE NUMBER OF HANGERS IN GROUPS BETWEEN LONGITUDINALS SHALL BE DETERMINED ON A BASIS OF THE NUMBER OF CABLES WHICH CAN BE SUITABLY CARRIED THROUGH LIGHTENING HOLES IN THE TRANSVERSE WEBS.
 2. THIS FIGURE SUPERSEDES SHEET 4B25 OF DRAWING 903-5001027 AND SECTION 2, SHEET 103, OF DRAWING NAVSEC NO. 9000-58702-7-3180.

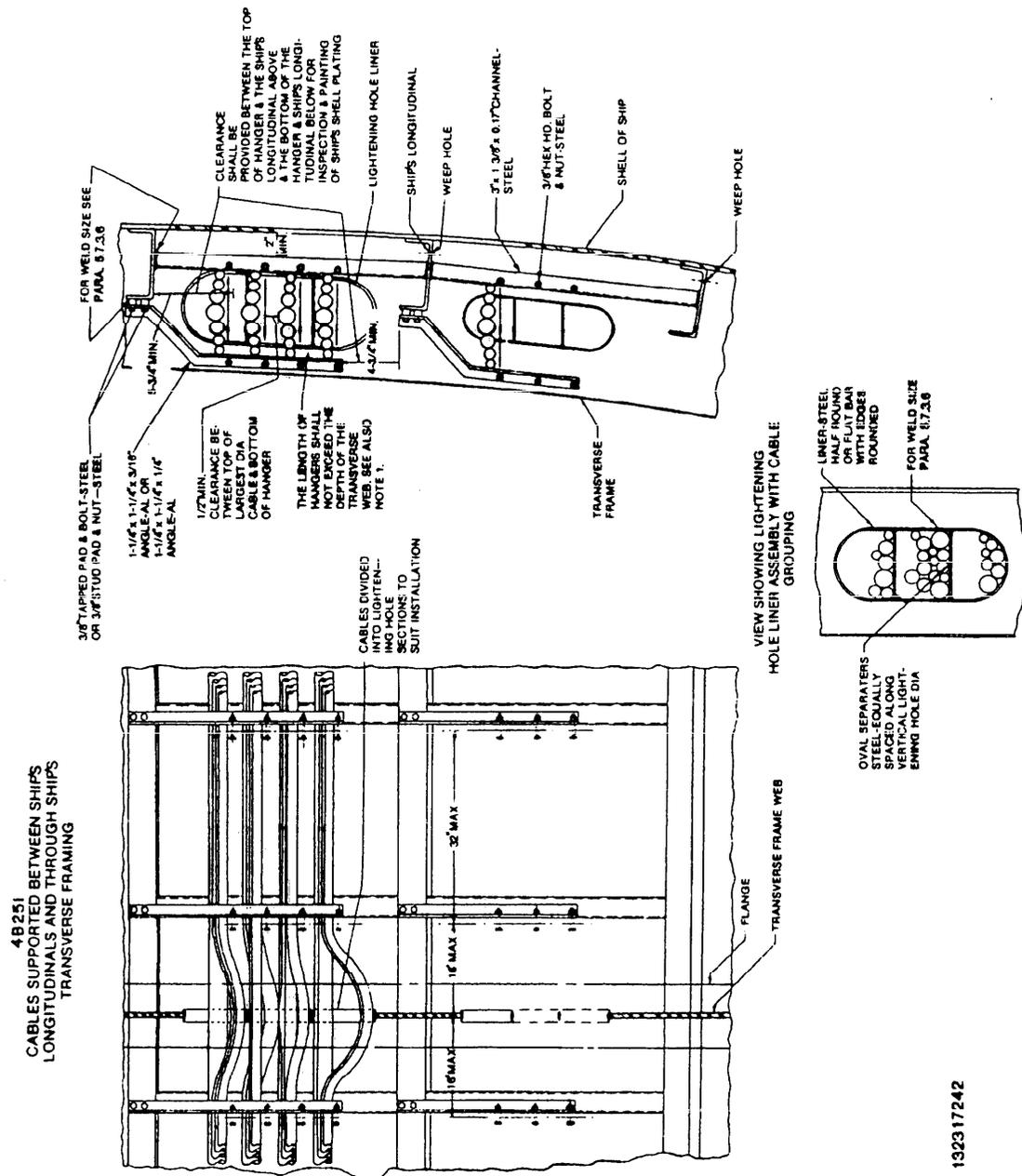


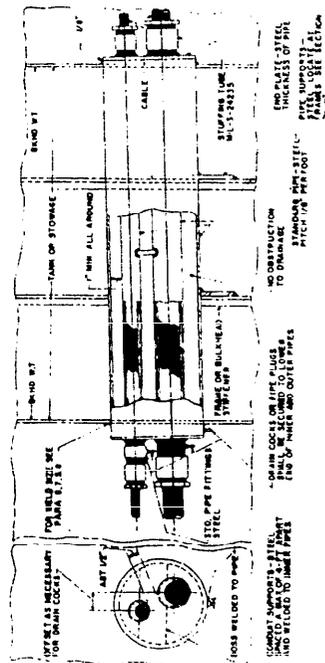
FIGURE 4B25. Multiple cableways in machinery spaces (surface ships).

NOTES:

1. UP TO 3 CABLES MAY BE USED IN THE INNER PIPE, PROVIDING NO MORE THAN TWO SIMULTANEOUSLY LOADED CABLES SHALL BE CONTIGUOUS TO EACH OTHER. THIS IS AN ALTERNATIVE METHOD AND WILL REQUIRE AN END PLATE ON THE PROTRUDING INNER PIPE WITH THE RISER TOPS TO BE WELDED DIRECTLY TO THE END PLATE.
2. THE STANDARD PIPE FOR METHODS 4B262 AND 4B263 SHALL BE CLEAN AND FREE OF ALL FOREIGN CONTAMINATION.
3. THIS FIGURE SUPERSEDES SHEET 4B26 OF DWG. 809-5001027 AND SECTION 2, SHEET 155, OF DRAWING NAVSEC NO. 9000-S6202-73960.

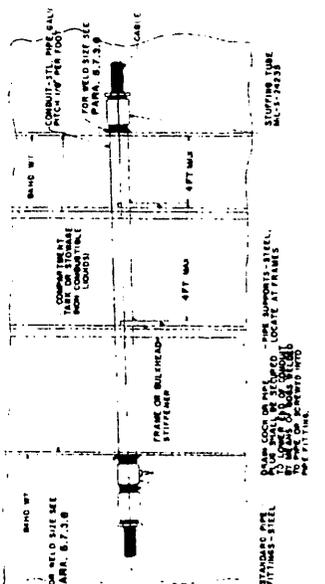
4B263

CABLES THROUGH HAZARDOUS LOCATIONS CONTAINING COMBUSTIBLE LIQUIDS WATERTIGHT INSTALLATIONS TWO OR MORE CABLES



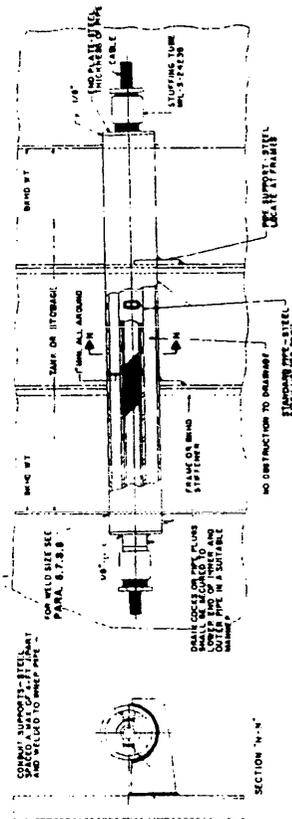
4B261

CABLES THROUGH CONDUIT WATERTIGHT INSTALLATION NON-HAZARDOUS LOCATION



4B262

CABLES THROUGH HAZARDOUS LOCATIONS CONTAINING COMBUSTIBLE LIQUIDS WATERTIGHT INSTALLATIONS A SINGLE CABLE



SH 132317243

FIGURE 4B26. Cableways through storage spaces & tanks.

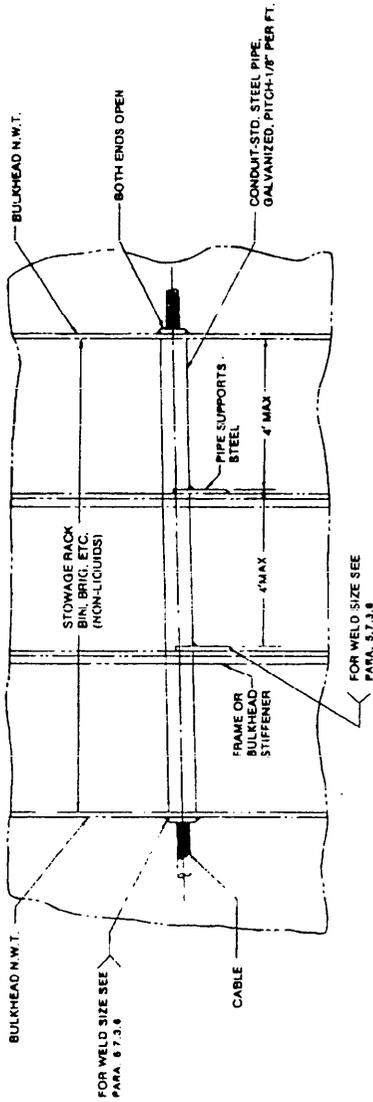
DOD-STD-2003-4 (NAVY)
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NOTE:

- 1. THIS FIGURE SUPERSEDES SHEET 4B27 OF DWG. 803-5001027 AND SECTION 2, SHEET 134, OF DRAWING NAVSEC NO. 8000-SH202-73990.

4B271

CABLES THROUGH CONDUIT
NON-WATERTIGHT INSTALLATIONS
NON-HAZARDOUS LOCATIONS



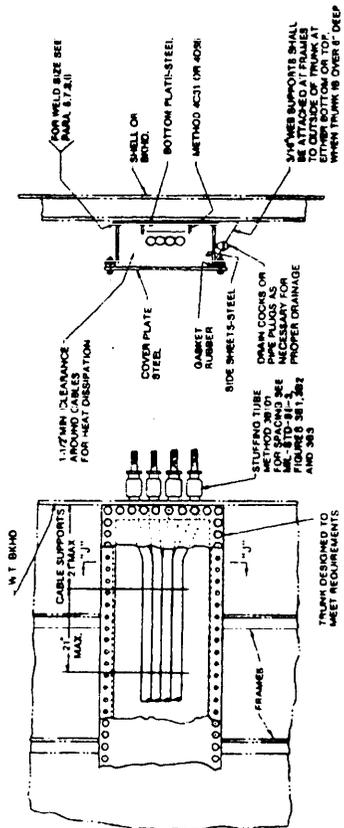
SH 132317244

FIGURE 4B27. Cableways through storage spaces & tanks (surface ships).

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- NOTES:
1. METHOD 4B281 MAY BE USED FOR FIRE PROTECTION.
 2. THIS FIGURE SUPERSEDES SHEET 4B28 OF DRAWING 903-5001027 AND SECTION 2, SHEET 153, OF DRAWING NAVSEC NO. 9000-58202-73680.

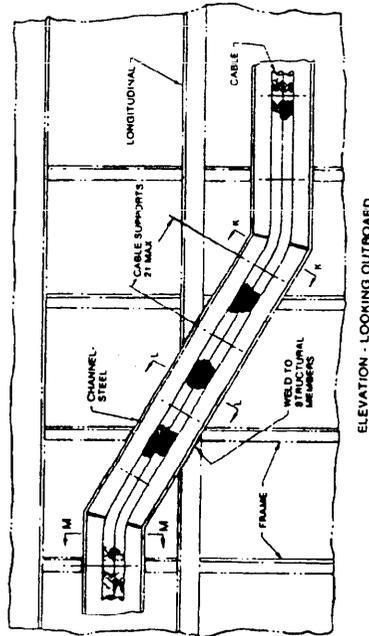
4B281
CABLES IN TRUNKS W.T. OR O.T.



ELEVATION

SECTION "J-J"

4B282
CABLES IN CHANNEL



ELEVATION - LOOKING OUTBOARD

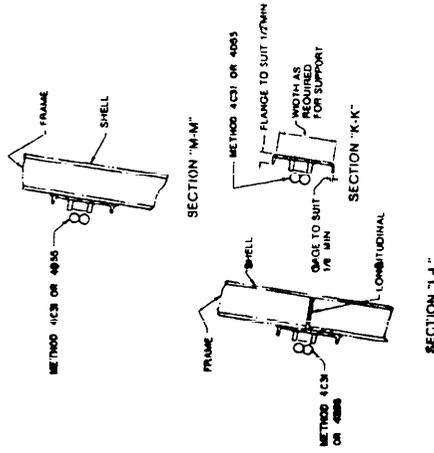


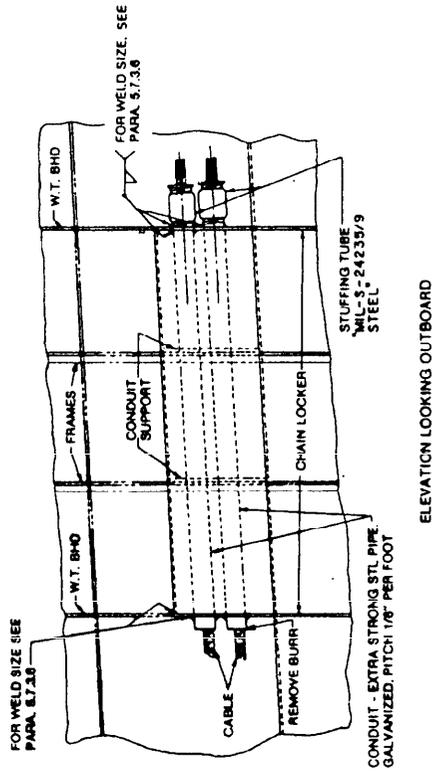
FIGURE 4B28. Cabways through trunks and channels (surface ships).

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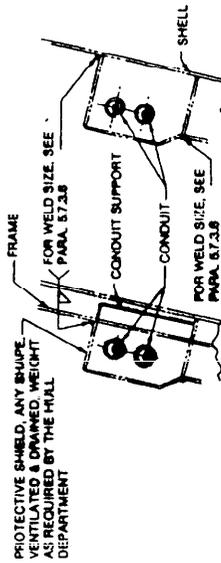
NOTES:

1. A MAX. OF 3 CABLES MAY BE USED IN THE INNER PIPE, PROVIDING NO MORE THAN TWO SIMULTANEOUSLY LOADED CABLES SHALL BE CONTIGUOUS TO EACH OTHER. THIS IS AN ALTERNATIVE METHOD AND WILL REQUIRE AN END PLATE ON THE PROTRUDING INNER PIPE WITH THE INNER TOPS TO BE WELDED DIRECTLY TO THE END PLATE.
2. THIS FIGURE SUPERSEDES SHEET 4B29 OF DRAWING 803-6001027 AND SECTION 2, SHEET 162 OF DRAWING NAVSPEC NO. 8000-58202-73800.

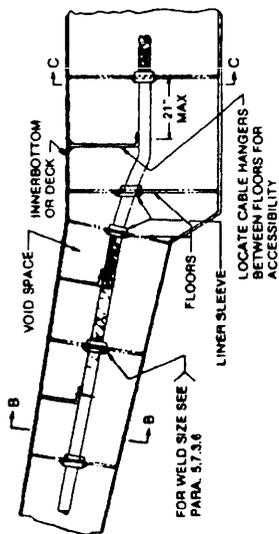
4B292
CABLES THROUGH CHAIN LOCKERS



ELEVATION LOOKING OUTBOARD



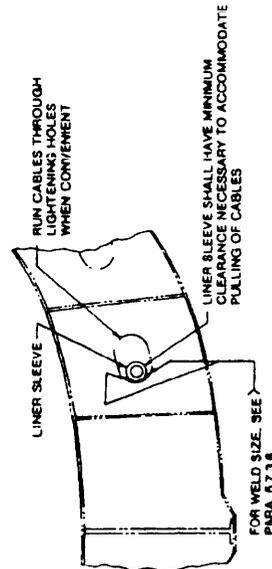
4B291
CABLES THROUGH VOID SPACES
NOT SUBJECT TO FLOODING



FOR WELD SIZE, SEE PARA. 5.7.3.6



SECTION B-B



SECTION C-C

SH 132317246

FIGURE 4B29. Cables through void spaces and chain lockers (surface ships).

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- NOTES:
1. INSTALL 3/4 INCH PIPE PLUG AND BOBS IN ENCLOSURE FOR PRESSURE TEST.
 2. ALL WELDING SHALL BE IN ACCORDANCE WITH PARA. 57.2.8 AND SHALL BE TESTED OIL TIGHT.
 3. ALTERNATE LOCATION FOR ACCESS OPENING WILL BE ON SIDE FILLER PLATE REQUIRING A HEAVIER PLATE.
 4. ACCESS COVER 2" GREATER THAN ACCESS OPENING ALL AROUND.
 5. THE INNER CONCENTRIC PIPE SHALL BE GALVANIZED. THE OUTER CONCENTRIC PIPE SHALL BE PAINTED TO CONFORM TO THE TANK PAINT SYSTEM.
 6. 1/8 INCH FIBER SHEET MAY BE CEMENTED IN PLACE TO PREVENT CABLE CHANGING IN LIEU OF MELAMINE SUPPORT.
 7. ALL BOLTS, NUTS, WASHERS, AND PLUGS SHALL BE OF A CORROSION RESISTANT MATERIAL.
 8. THIS FIGURE SUPERSEDES SHEET 4830 OF DRAWING 803-5001027 AND SECTION 2, SHEET 151, OF DRAWING NAVSEC NO. 9000-88202-73980.

48302

ALTERNATE ENCLOSURE METHOD
(USING STRINGERS OF LONGITUDINALS)

48301

CABLE THROUGH CONDUIT IN FUEL OIL TANKS
WATERTIGHT INSTALLATION-SINGLE CABLE

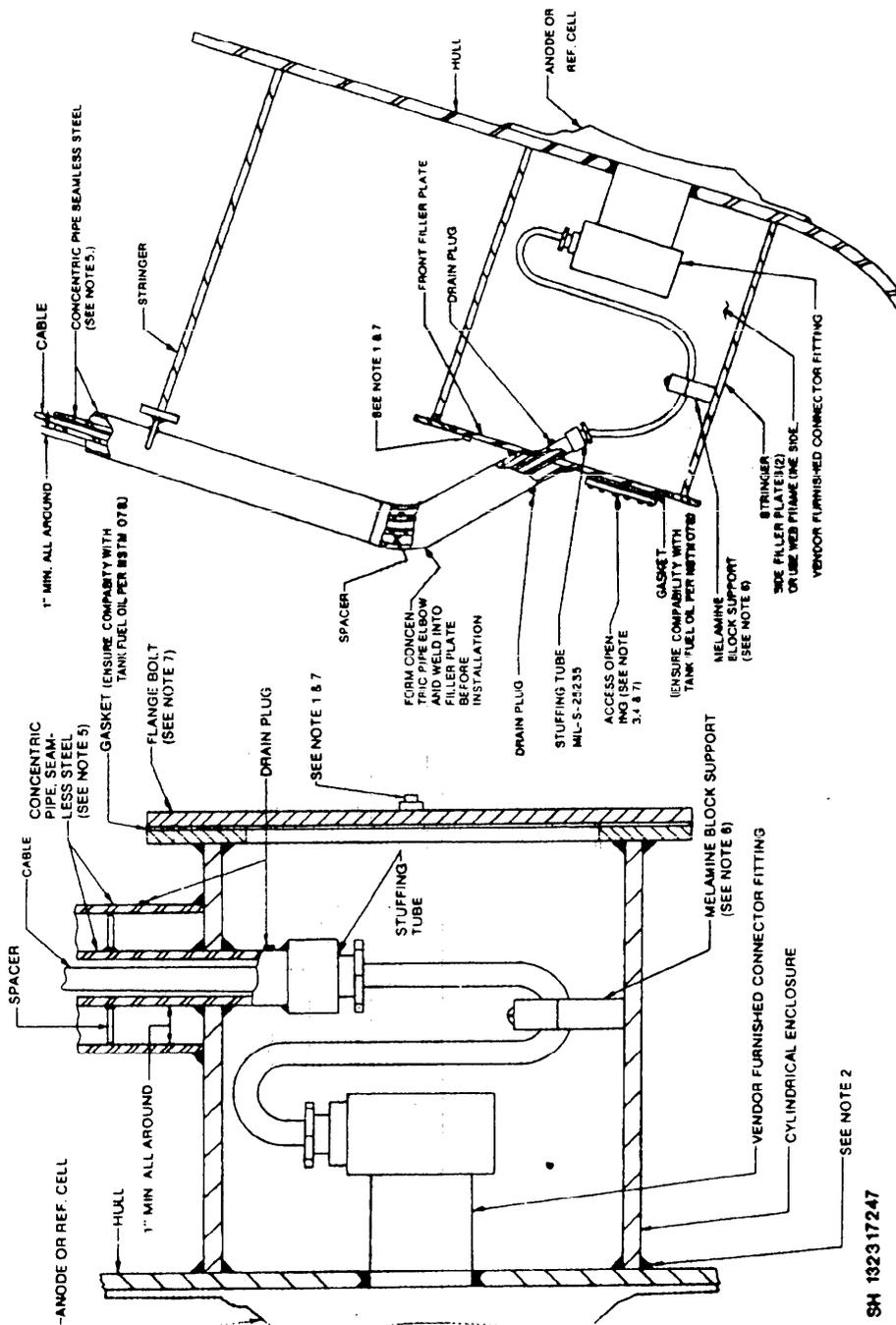


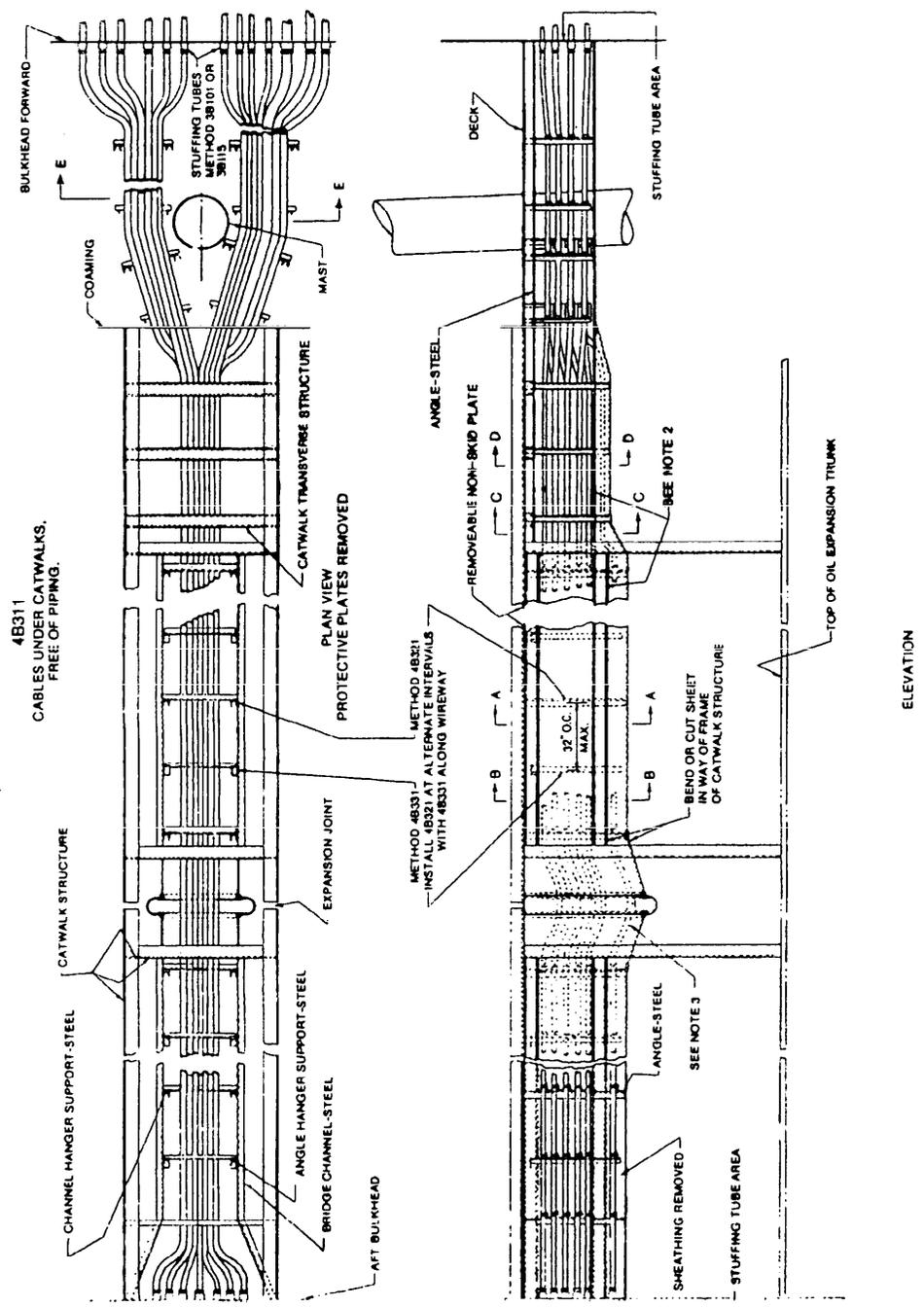
FIGURE 4830. Cableways through fuel oil tanks for cathodic protection system (surface ships).

SH 132317247

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NOTES:

1. ALL MILD STEEL MATERIAL USED FOR SUPPORTING AND PROTECTING CABLES UNDER CATWALK, SHALL BE ZINC COATED AFTER DRILLING AND PRIOR TO INSTALLATION. THE COMPLETE INSTALLATION SHALL BE PAINTED.
2. BOLTS USED TO SECURE PROTECTIVE SHEATH SHALL BE SPACED 8 INCHES O.C. APPROX. SECTIONS OF PROTECTIVE SHEATHING SHALL BE 4 IN. PLATE AND NOT EXCEED APPROX. 84 INCHES IN LENGTH (SIDE AND BOTTOM OF WIREWAY).
3. PROVIDE SUFFICIENT SLACK IN CABLES FOR WORKING OF CATWALKS AND FOR CLEARANCE BETWEEN CABLES AND BOTTOM FRAMING.
4. THIS FIGURE SUPERSEDES SHEET 4B31 OF DWG. 863-5001027 AND SECTION 2, SHEET 186 OF DRAWING NAVSEC NO. 9000-58202-73960.



ELEVATION
FOR SECTION AND DETAIL VIEWS
SEE FIGURES 4B32 THRU 4B38

SH 192317248

FIGURE 4B31. Topside cableways on tankers.

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NOTES:
1. THIS FIGURE SUPERSEDES SHEET 4B32 OF DRAWING
803-5001027 AND SECTION 2, SHEET 158, OF DRAWING
NAVSEC NO. 9000-S6202-73980.

4B321
VIEW SHOWING SUPPORT OF CABLES AND SHEATHING
USING CHANNEL CABLE HANGERS
ATTACHED TO BRIDGE CHANNELS

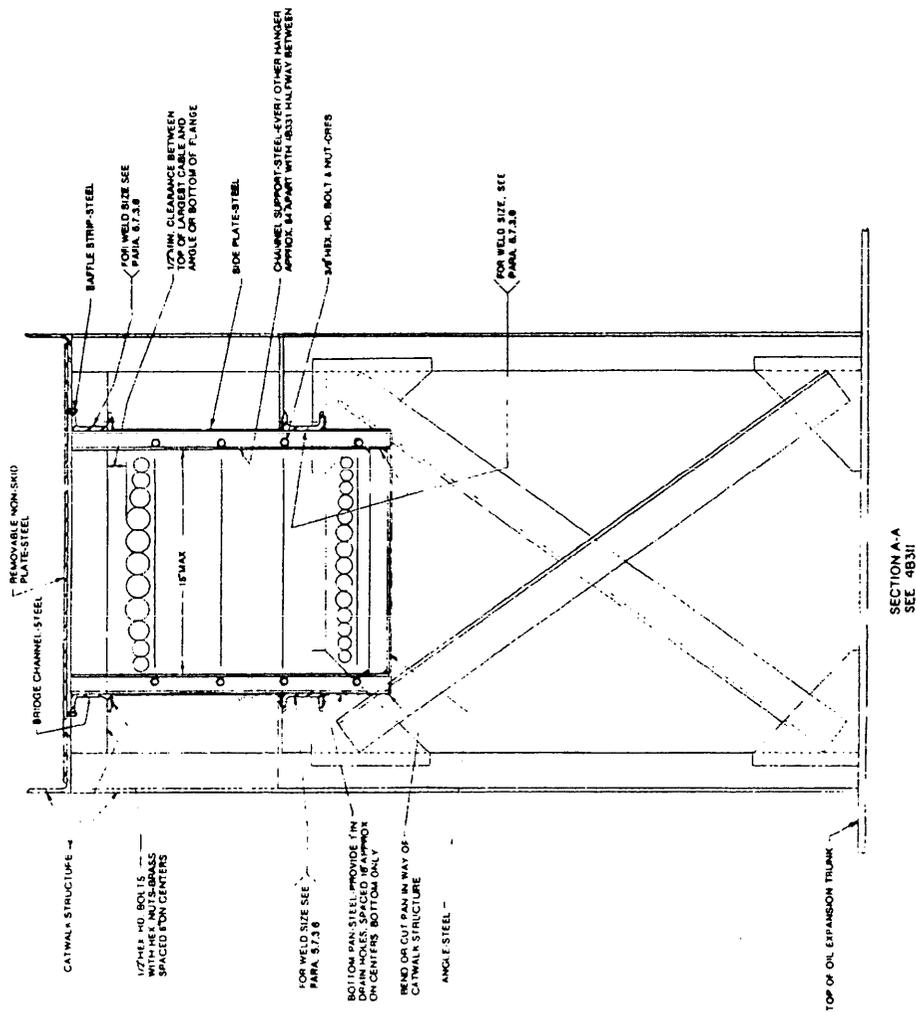


FIGURE 4B32. Topside cableways on tankers.

SH 132317249

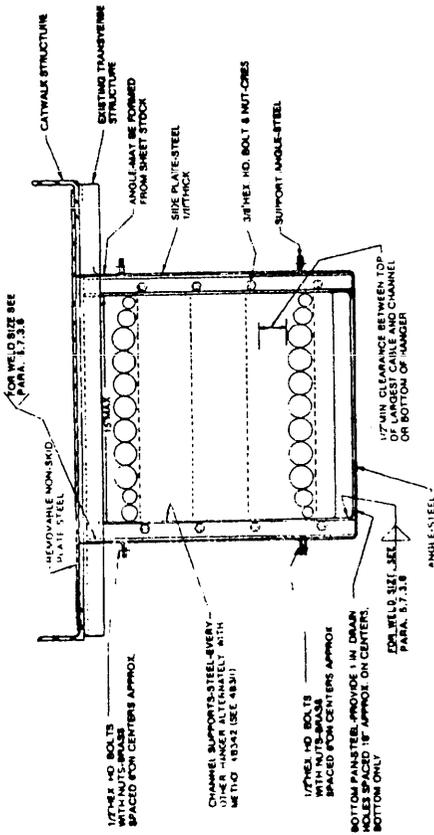
DOD-STD-2003-4 (NAVY)
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TOPSIDE CABLES ON TANK VESSELS

NOTES:
1. THIS FIGURE SUPERSEDES SHEET 4B34 OF DWD, 803-6001027 AND SECTION 7, SHEET 161 OF DRAWING, NAVSEC NO. 8000-8202-73940

4B341

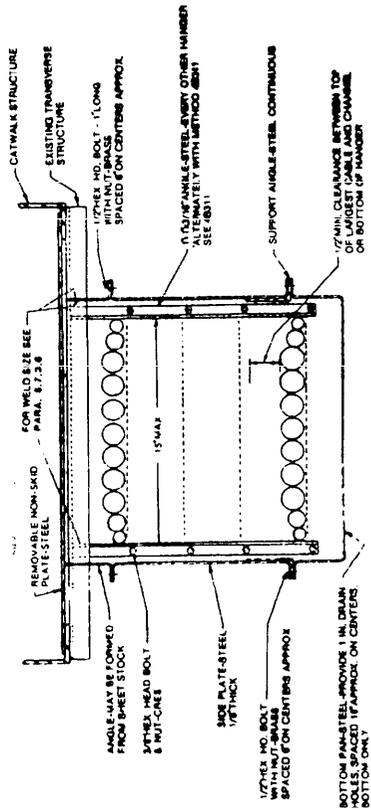
VIEW SHOWING CHANNEL HANGER SUPPORT SUSPENDED FROM CATWALK TRANSVERSE STRUCTURE



SECTION C-C
SEE 4B311

4B342

VIEW SHOWING ANGLE HANGER SUPPORT SUSPENDED FROM CATWALK TRANSVERSE STRUCTURE



SECTION D-D
SEE 4B311

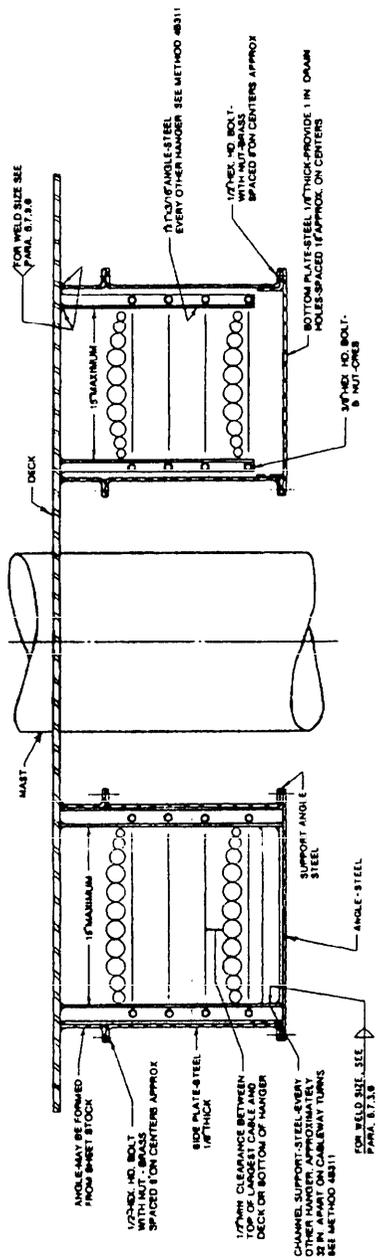
SH 132317251

FIGURE 4B34. Topside cableways on tankers.

DOD-STD-2003-4 (NAVY)
24 JUNE 1987

NOTES:
1. THIS FIGURE SUPERSEDES SHEET 4835 OF DRAWING
803-5001027 AND SECTION 2, SHEET 162, OF DRAWING
NAVSEC NO. 9000-56202-73980.

48351
VIEW SHOWING CABLEWAY
DIVIDED TO PASS AN OBSTRUCTION



SECTION E-E
SEE 48311

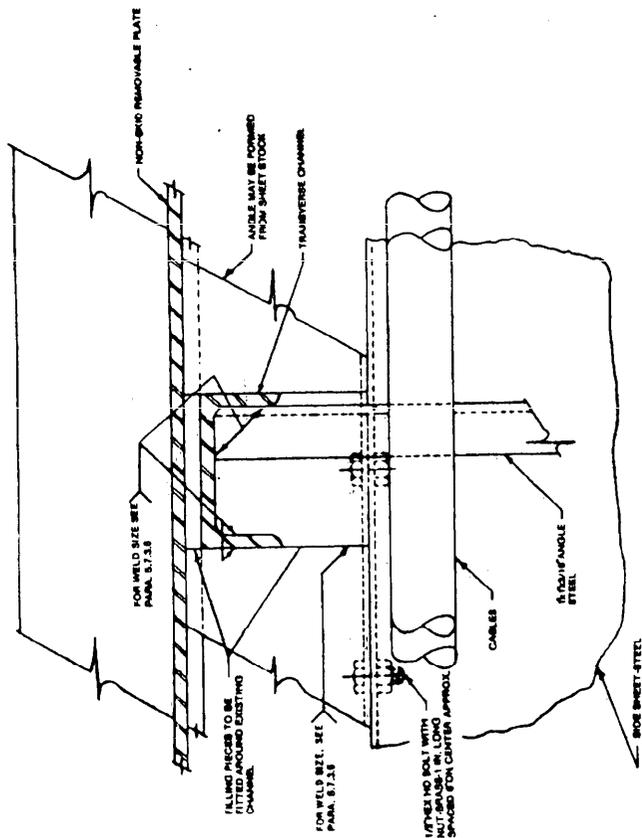
FIGURE 4835 Topside cableways on tankers.

SH 132317262

DOD-STD-2003-4 (NAVY)
24 JUNE 1987

NOTES:
1. THIS FIGURE SUPERSEDES SHEET 4B36 OF DRAWING
903-5001027 AND SECTION 2, SHEET 103, OF DRAWING
NAVSEC NO. 9000-56202-73990.

4B361
VIEW SHOWING
HANGER SUPPORT
ATTACHED TO TRANSVERSE MEMBER
SEE METHOD 4B311



SH 132317263

FIGURE 4B36. Topside cableways on tankers.

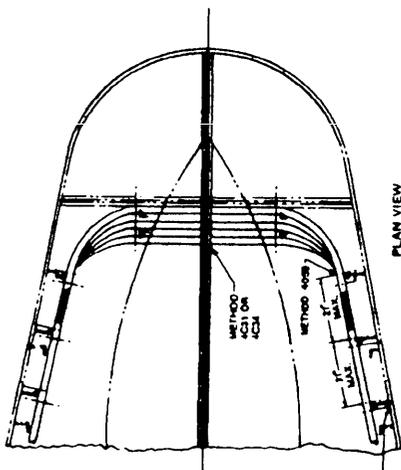
DOD-STD-2003-4 (NAVY)
24 JUNE 1987

NOTES:

1. WHEN INSULATION IS USED WITH DEGAUSSING CABLES, USE CORRESPONDING INSULATION METHODS FOR CABLE NUMBER METHODS LISTED.
2. USE APPROPRIATE BALLISTIC METHODS FOR DEGAUSSING CABLE INSTALLATIONS AS REQUIRED.
3. METHODS SHOWN ON THIS FIGURE MAY BE USED FOR GENERAL INSTALLATIONS WHERE APPLICABLE.
4. THIS FIGURE SUPERSEDES SHEET 4837 OF DRAWING 803-5001027 AND SECTION 2, SHEET 144, OF DRAWING NAVSEC NO. 9000-38202-73980.

48371

CABLES IN TURN OF BOW ATTACHMENT TO GIRDER



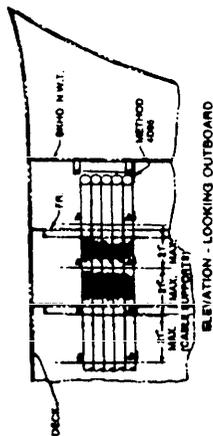
FOR WELD SIZE SEE PARA. 87.2.8

FOR WELD SIZE SEE PARA. 87.2.8

CABLES ATTACHED TO GIRDER (METHOD 4021 OR 4029)

48372

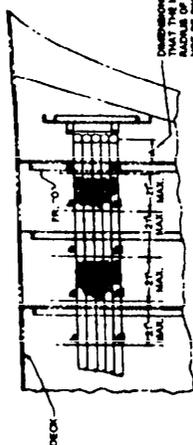
CABLES IN TURN OF BOW ATTACHMENT TO BU-KHEAD



ELEVATION - LOOKING OUTBOARD

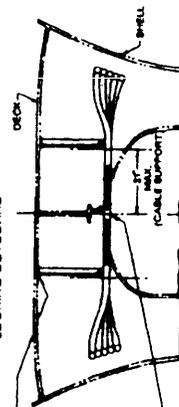
48373

CABLES IN TURN OF BOW EXTENDING FORWARD OF FRAME 'O'

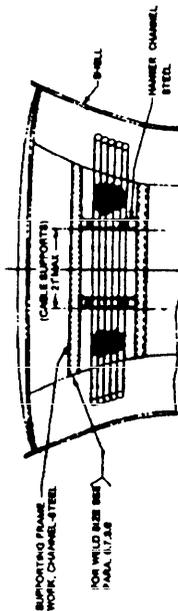


ELEVATION - LOOKING OUTBOARD

ELEVATION
LOOKING OUTBOARD



TYPICAL FRAME
LOOKING FORWARD



TYPICAL FRAME
LOOKING FORWARD

FIGURE 4837. Cable support for degaussing cables (surface ships).

SH 132317264

DOD-STD-2003-4 (NAVY)
24 JUNE 1987

- NOTES:
1. GRADE CONDUIT 1/8" PER FOOT MINIMUM.
 2. CABLE CONDUIT SHALL BE OF COPPER NICKEL PIPE.
 3. METHODS SHOWN ON THIS SHEET MAY BE USED FOR GENERAL INSTALLATION WHERE APPLICABLE.
 4. THIS FIGURE SUPERSEDES SHEET 4B330 OF DRAWING 803-5001027 AND SECTION 2, SHEET 145, OF DRAWING NAVBEC NO. 9000-88202-73980.

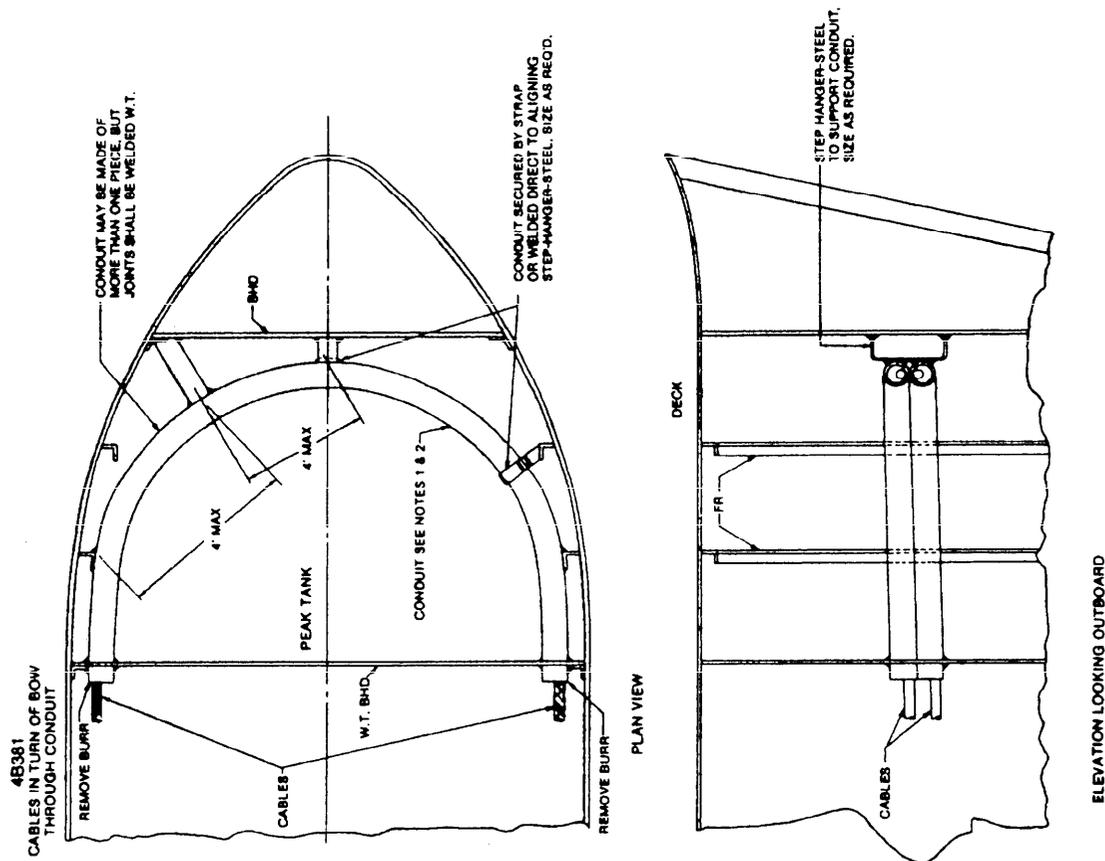


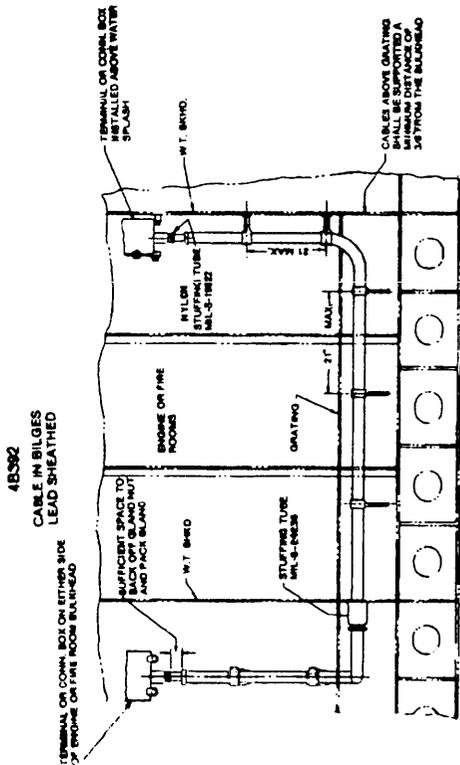
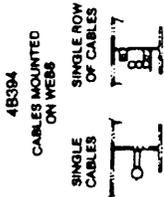
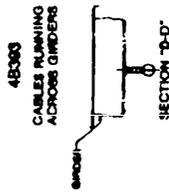
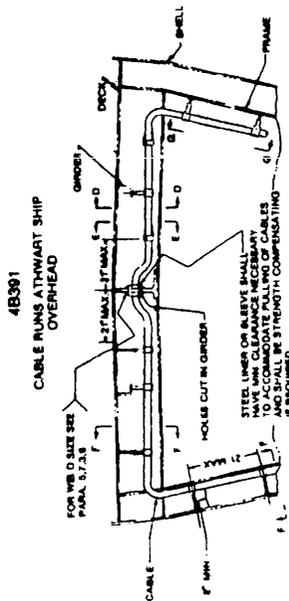
FIGURE 4B36. Cable support for degassing cables (surface ships).

SH 132317255

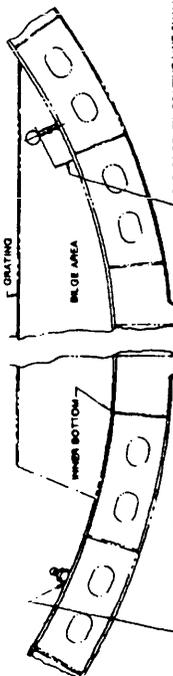
DOO-8TD-2003-4 (NAVY)
24 JUNE 1987

NOTES
1. METHODS SHOWN ON THIS SHEET MAY BE USED FOR GENERAL INSTALLATION WHERE APPLICABLE.
2. THIS FIGURE SUPERSEDES SHEET 48398 OF DRAWING 803-801037 AND SECTION 2, SHEET 146, OF DRAWING NAVSEC NO. 9000-58703-73980.

METHODS SHOWN ON THIS SHEET MAY BE USED FOR INSTALLATIONS WHERE APPLICABLE



ELEVATION LOOKING OUTBOARD



SH 132317256

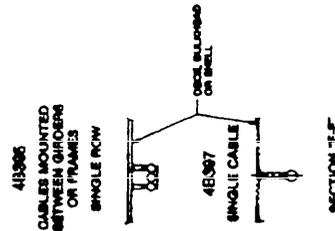
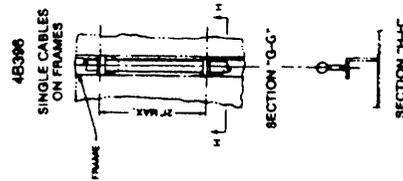
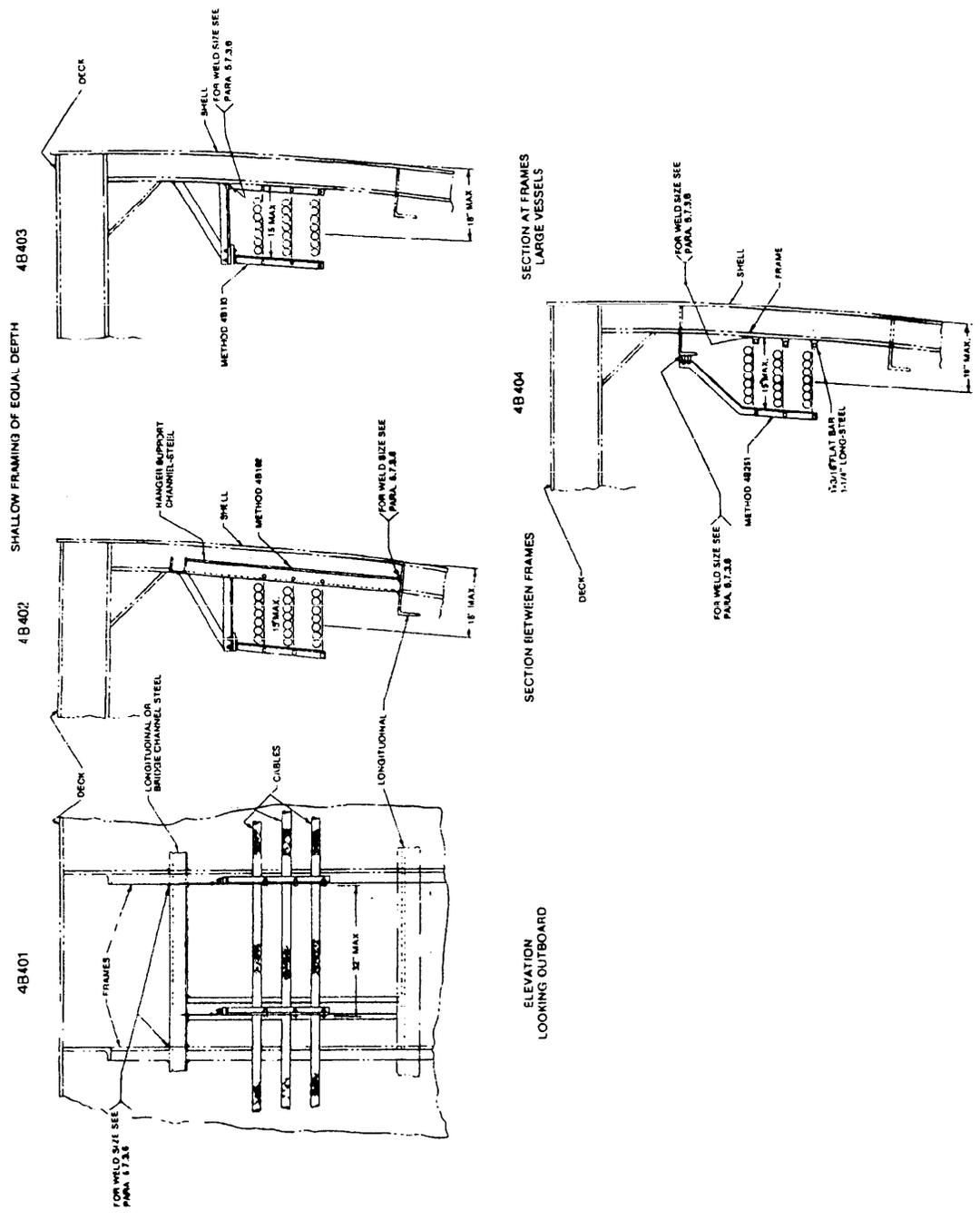


FIGURE 4839: Cable support for degaussing cables (surface ships).

DOD-STD-2003-4 (NAVY)
24 JUNE 1987

- NOTES:
1. METHODS SHOWN ON THIS SHEET MAY BE USED FOR GENERAL INSTALLATIONS WHERE APPLICABLE.
 2. THIS FIGURE SUPERSEDES SHEET 4B40 OF DRAWING 809-500 1027 AND SECTION 2, SHEET 147, OF DRAWING NAVSEC NO. 9000-96202-73960.



SECTION AT FRAMES SMALL VESSELS

FIGURE 4B40. Cable support for degaussing cables (surface ships).

SH 132317267

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NOTES

- 1. WHERE LIGHT TIGHTNESS IS REQUIRED, CABLES PASSING THROUGH N.W.T. BULKHEADS SHALL BE RUN THROUGH INDIVIDUAL LINER SLEEVES AND THEN CAREFULLY PACKED WITH PLASTIC SEALER SPEC MIL-3004 TYPE-4F.
- 2. METHODS SHOWN ON THIS FIGURE MAY BE USED FOR GENERAL INSTALLATIONS WHERE APPLICABLE.
- 3. THIS FIGURE SUPERSEDES SHEET 4641 OF DRAWING 813-5011027 AND SECTION 2, SHEET 148, OF DRAWING NAVSEC NO. 9000-38202-73680.

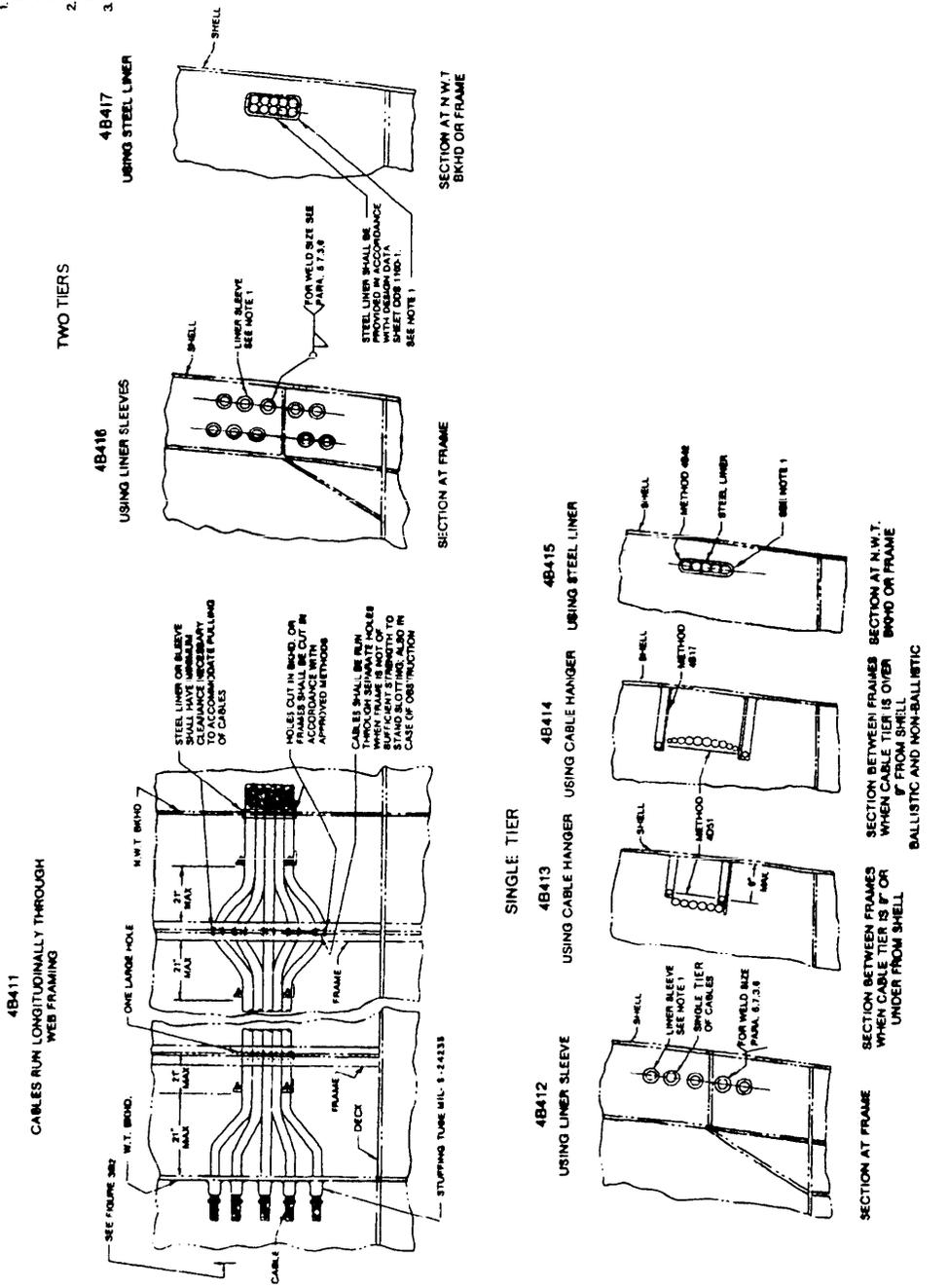


FIGURE 4B41. Cable support for degaussing cables (surface ships).

SH 132317258

DOD-STD-2003-4 (NAVY)
24 JUNE 1987

NOTES:
1. METHODS SHOWN ON THIS SHEET MAY BE USED FOR GENERAL INSTALLATIONS WHERE APPLICABLE.
2. THIS FIGURE SUPERSEDES SHEET 4B42 OF DRAWING 800-5001027 AND SECTION 2, SHEET 148 OF DRAWING NAVSEC NO. 9000-56202-73980.

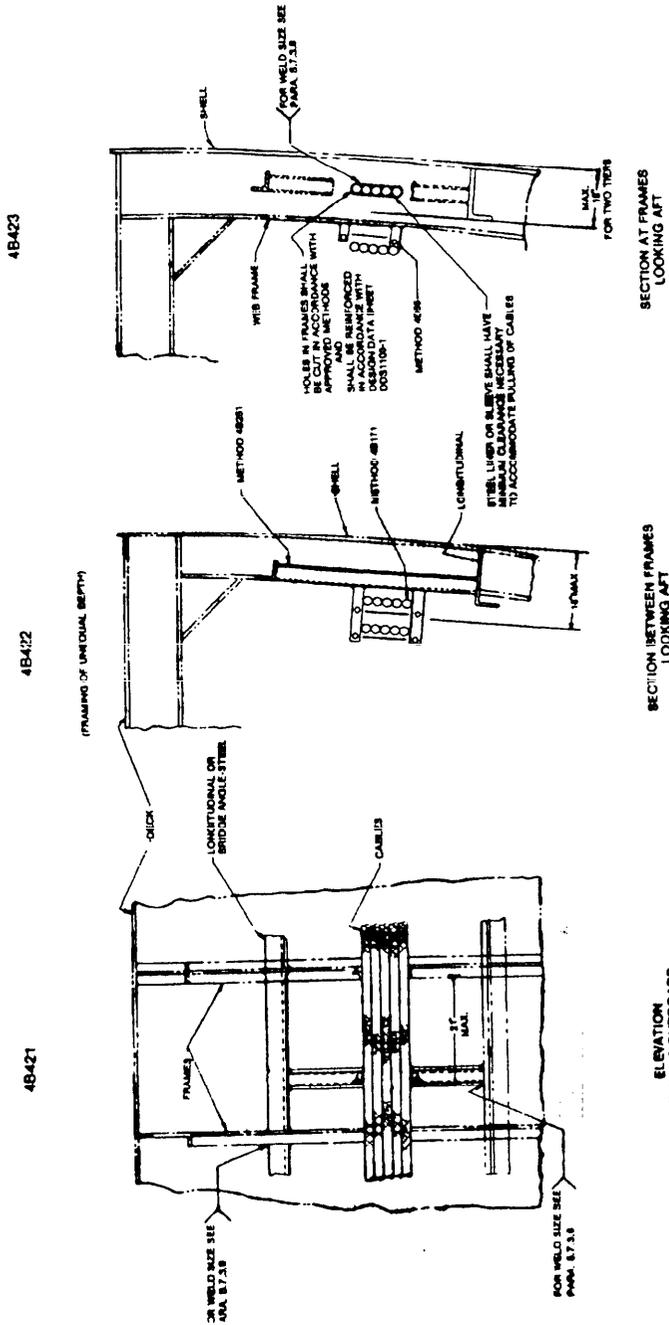


FIGURE 4B42. Cable support for degaussing cables (surface ships).

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24 JUNE 1987

- NOTES:
1. FOR NON-MAGNETIC APPLICATION SEE PARA 5.7.12
 2. THIS FIGURE SUPERSEDES SHEET 4B43 OF DRAWING 800-600 K127 AND SECTION 2, SHEET 82 OF DRAWING NAVSEC NO. 9000-56202-73960.

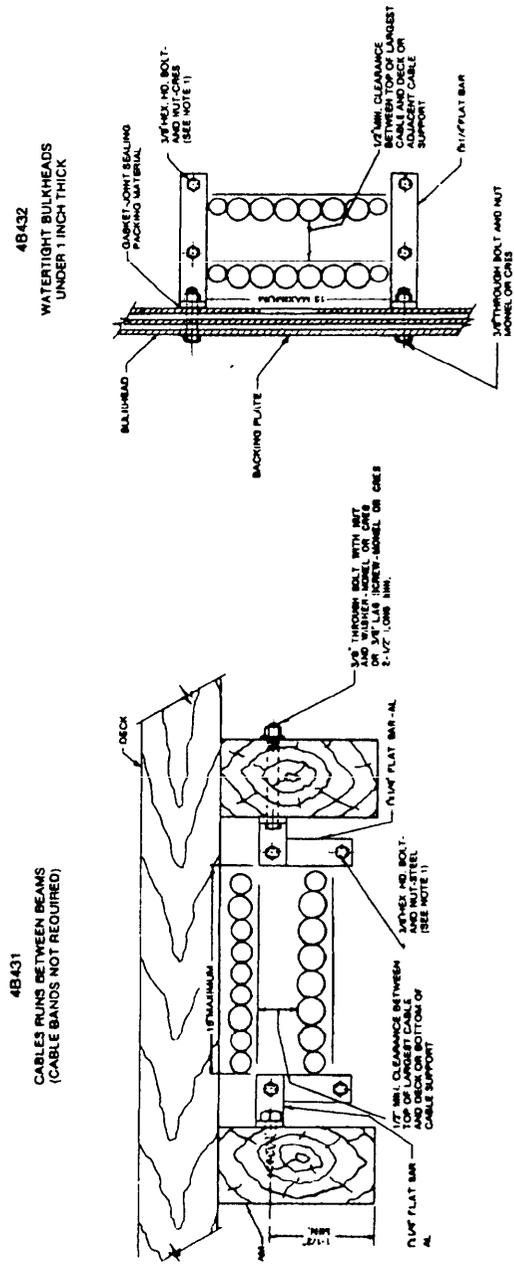
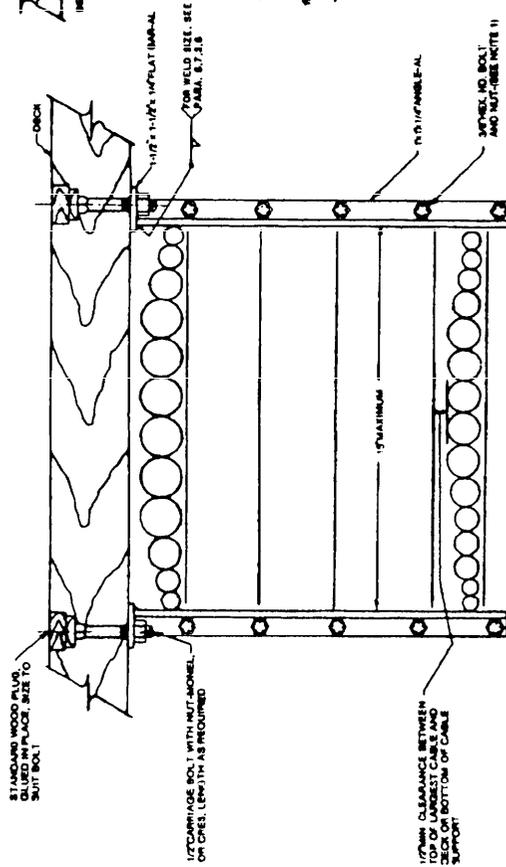


FIGURE 4B43. Cableways on wooden ships (surface ships).

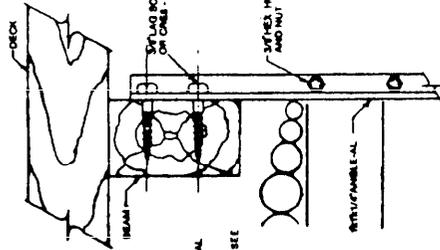
DOD-BTD-2003-4 (NAVY)
24 JUNE 1987

NOTES
1. FOR NON-MAGNETIC APPLICATION SEE PARA. 671.2.
2. THIS FIGURE SUPERSEDES SHEET 4B45 OF DRAWING 801-500 1007
AND SECTION 2 SHEET 61 OF DRAWING NAVSEC NO.
9000-9802-7380.

4B451
HANGER SUPPORTS
SECURED TO WATERTIGHT DECKS



4B452
HANGER SUPPORTS
SECURED TO BEAMS



4B453
HANGER SUPPORTS
SECURED TO BEAMS

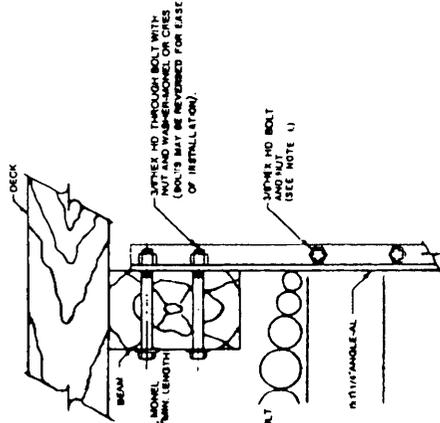


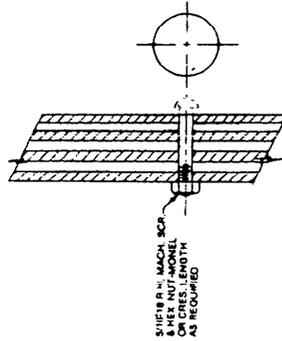
FIGURE 4B45. Cableways for wooden ships (surface ships).

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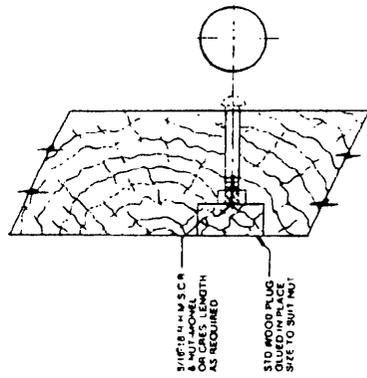
NOTES:

- 1. METHODS SHOWN ON THIS SHEET ARE FOR USE WITH THE CABLES UP TO 2 IN DIA FOR CABLES GREATER THAN 2 IN DIA USE METHODS SHOWN ON FIGURES 4B44, 4B49 & 4B50.
- 2. THIS FIGURE SUPERSEDES SHEET 4B46 OF DRAWING 800-4001027 AND SECTION 2, SHEET 192, OF DRAWING NAVSEC NO. 8000-56202-73900.

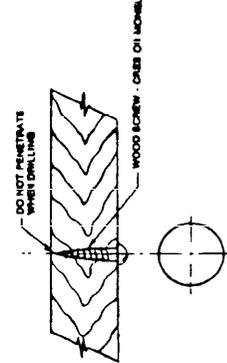
4B46-1
WATERTIGHT BULKHEADS OVER 1" MAX. THICKNESS
WHERE MOISTURE OR DRIP IS PRESENT
CABLE SUPPORTED HORIZONTALLY



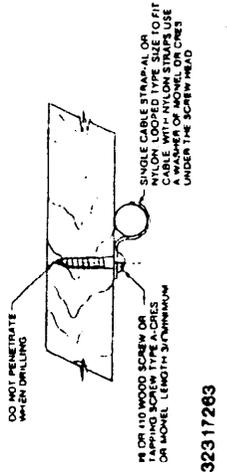
4B46-2
WATERTIGHT BULKHEADS OVER 1" THICK
WHERE MOISTURE OR DRIP IS PRESENT
CABLE SUPPORTED VERTICALLY



4B46-3
DECKS OR BULKHEADS OVER 1" THICK
ALSO FOR BEAMS



4B46-4
DECKS OR BULKHEADS OVER 1" THICK
ALSO FOR BEAMS
CABLES WITH A MAXIMUM DIA. OF 5/8"
SINGLE SUPPORT ALUM. CABLE STRAPS



SH 132317263

FIGURE 4B46. Cableways for wooden hull ships (surface ships).

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NOTES:

1. METHODS SHOWN ON THIS SHEET MAY BE USED IN LIEU OF THOSE SHOWN ON FIGURES 4B48, 4B49 & 4B50.
2. THIS FIGURE SUPERSEDES SHEET 4B47 OF DRAWING 803-5001027 AND SECTION 2, SHEET 208 OF DRAWING NAVSEC NO. 8000-38202-7-3980.

4B471
SINGLE TIER OF CABLES
SUPPORTED FROM WATER-TIGHT BULKHEADS
UNDER 1 INCH THICKNESS

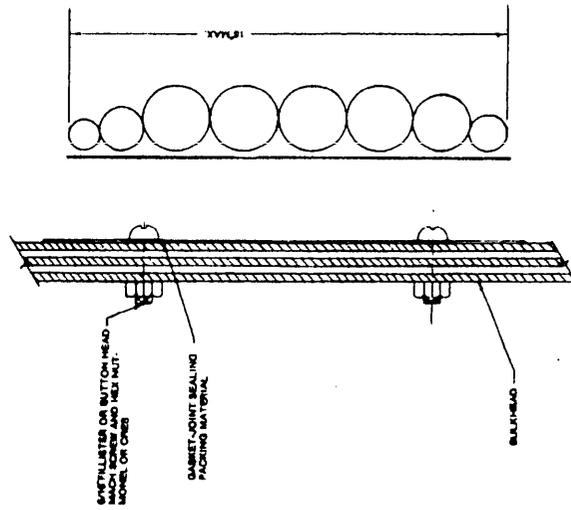


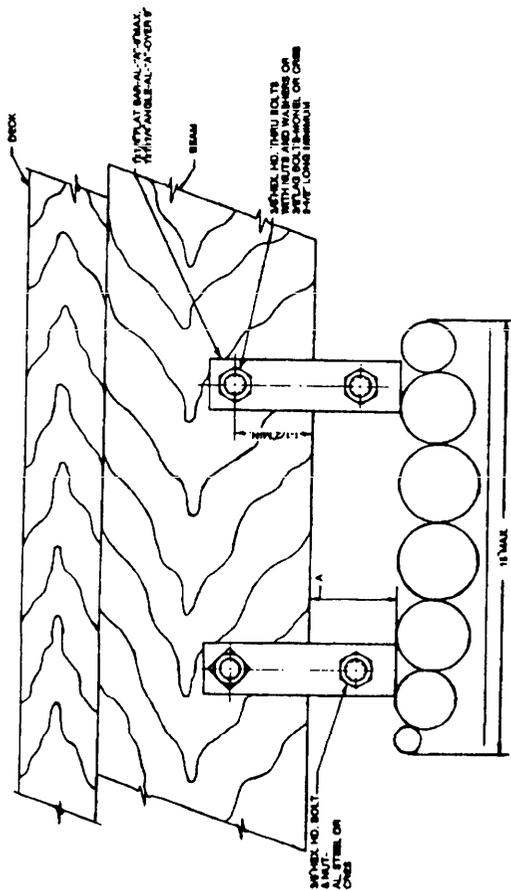
FIGURE 4B47. Cableways for wooden ships (surface ships).

SH 132317264

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4B481

A SINGLE TIER OF CABLES
SUPPORTED FROM BEAMS



NOTES:
1. THIS FIGURE SUPERSEDES SHEET 4B48 OF DRAWING 803-1001027
AND SECTION 2, SHEET 207, OF DRAWING NAVSEC NO.
8000-86202-73900.

FIGURE 4B48. Cabloways for wooden ships (surface ships).

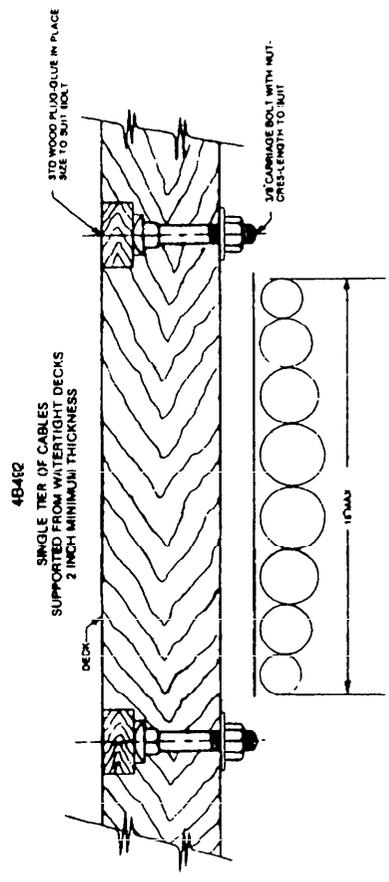
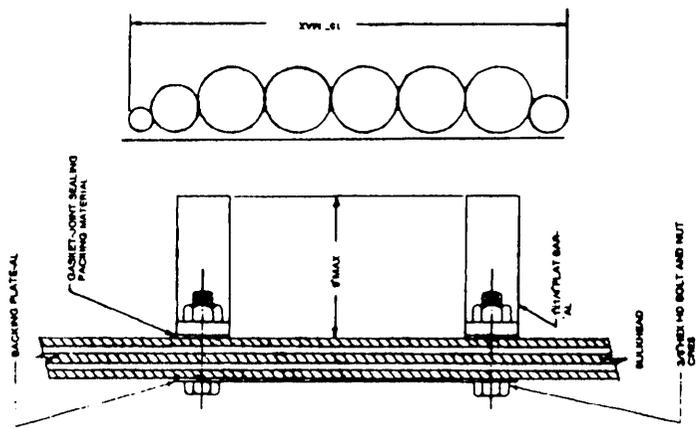
SH 132317265

DOD-STD-2003-4 (NAVY)
24 JUNE 1987

NOTES

- 1. THIS FIGURE SUPERSEDES SHEET 4B49 OF DRAWING 803-5001027 AND SECTION 2, SHEET 208, OF DRAWING NAVSEC NO. 8000-81202-73980.

4B491
SINGLE TIER OF CABLE
SUPPORTED FROM WATERTIGHT BULKHEADS
UNDER 1 INCH IN THICKNESS



SH 132317288

FIGURE 4B49. Cableways for wooden ships (surface ships).

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NOTES
1 THIS FIGURE SUPERSEDES SHEET #850 OF DRAWING 800-1001027
AND SECTION 2, SHEET 208 OF DRAWING NAVSEC NO.
9000-96202-73980.

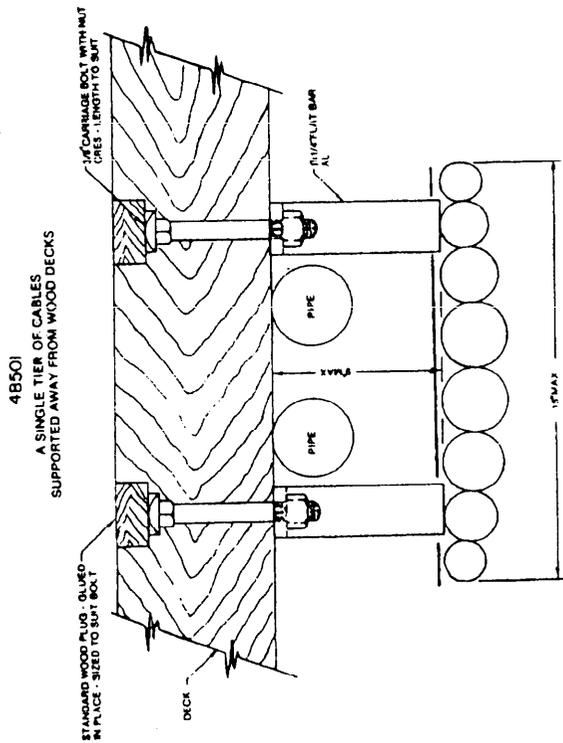
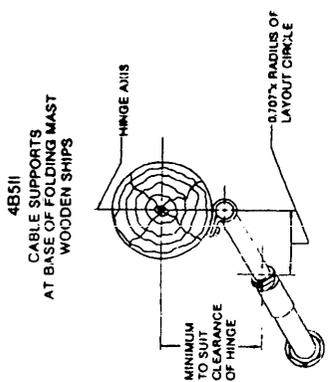


FIGURE 4B50. Cabways for wooden ships.

8H 1323 17267

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CABLE AT BASE OF FOLDING MAST



- NOTES:
1. THE DIMENSION USED FOR "r" SHOULD NOT BE LESS THAN 4 INCHES.
 2. WHERE MORE THAN ONE CABLE IS INVOLVED USE THE BENDING RADIUS OF THE LARGEST CABLE TO FIND "r".
 3. CABLE SHOULD BE FIRMLY FASTENED WITH MAST IN 45° POSITION TO INSURE PROPER LENGTH FOR FLEETING.
 4. THIS FIGURE SUPERSEDES SHEET 4B51 OF DRAWING 803-500 1027 AND SECTION 2, SHEET 218, DRAWING, MAYSEC NO. 9000-58202-73980.

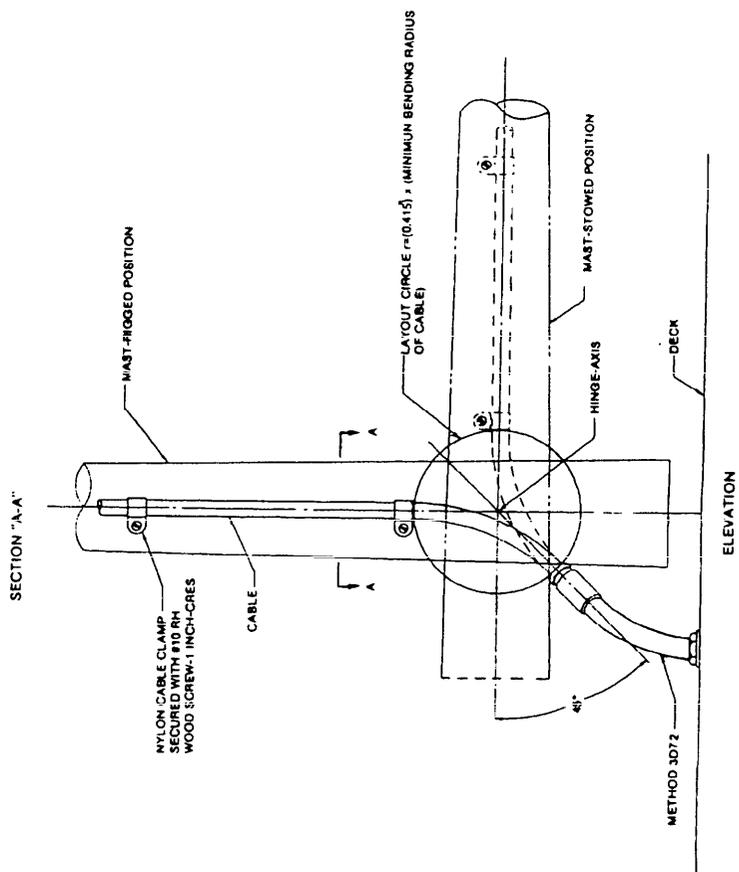


FIGURE 4B51. Cablways on folding masts (surface ships).

SH 132317268

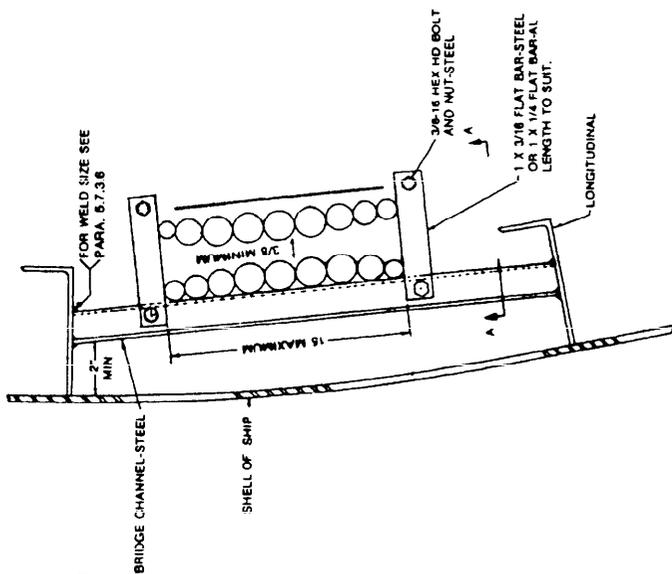
DOD-STD-2003-4 (NAVY)
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MAIN RUN CABLES
SMALL VESSELS

NOTES:

1. THIS FIGURE SUPERSEDES SHEET 4B53 OF DRAWING 803-5001027 AND SECTION 2, SHEETS 08 & 09, OF DRAWING NAVSEC NO. 0000-S6202-73980.

4B532
CABLES THROUGH ENGINE AND BOILER ROOMS
SUPPORTED BETWEEN SHIPS LONGITUDINALS.



4B531
CABLES THROUGH ENGINE AND BOILER ROOMS
SUPPORTED BETWEEN SHIPS LONGITUDINALS.

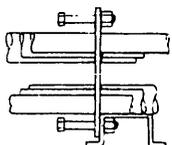
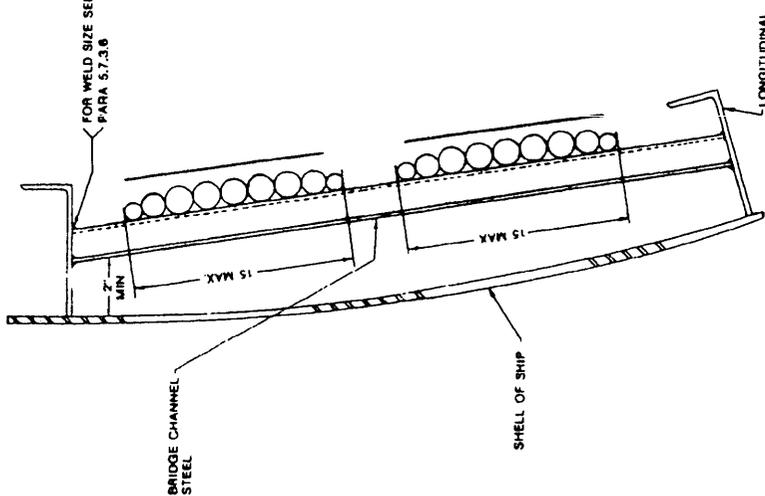


FIGURE 4B53. Cableways of main cable runs on small vessels.

SH 132317270

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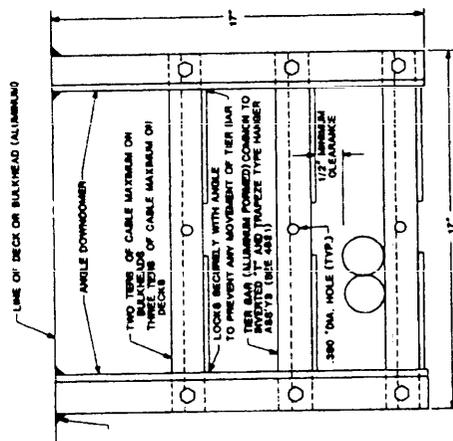
NOTES:

1. SPACING, NUMBER OF TIERS AND CABLE WEIGHT SHALL NOT EXCEED THE VALUES SPECIFIED BELOW. DOWNWARD EXTENSION TO THE LESSES CONDITION OF FEWER TIERS FOR HANGER ASSEMBLIES (WITH CABLE LOAD NOT EXCEEDING THE MAXIMUM PER TIER AS SPECIFIED BELOW) IS ACCEPTABLE.

CABLE RUN	TYPE ASSY.	CENTER TO CENTER SPACING (INCHES)	MAX. NO. OF TIERS	MAX. CABLE WT. (LBS.) SUPPORTED BY EA. TIER
HORIZONTAL	DECK	24	3	43.5
	MTD.	36"	17"	
VERTICAL	BLK. HD	24	2	43.5
	MTD.	20"	17"	

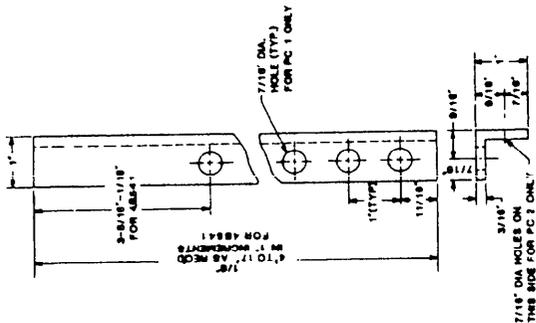
2. SHARP CORNERS SHALL BE SLIGHTLY ROUNDED. ALL PARTS SHALL HAVE SMOOTH SURFACES.
3. FOR SPACING OF HANGERS SEE FIGURE 4B55
4. SEE FIGURE 4C23 FOR INSTALLATION OF BONDING STRAPS
5. THIS FIGURE SUPERSEDES SHEET 4B54 OF DRAWING 803-5001027

4B54 I



CONTINUOUS WELD.
SEE PARA. 8.2.3.9

3/8" - 18x1" HEX. HD. BOLT,
W/LOCKWASHER AND NUT, GRES

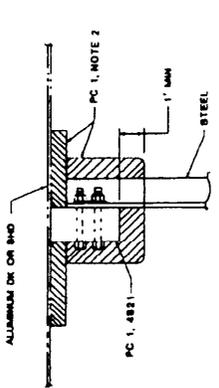


ANGLE DOWNCOMER
ALUMINUM ALLOY 6061-T6

FIGURE 4B54. Multiple cableway supports on aluminum or steel decks and bulkheads (surface ships only).

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DETAIL OF FIRE PROTECTION INSTALLATION
(TYPICAL FOR ALUMINUM DECKS AND BULKHEADS, NOTE 2)

- NOTES:
1. SEE FIGURES 4C22 & 4C23 FOR INSTALLATION OF BINDING STRAPS.
 2. FIRE INSTALLATION DETAIL SHALL BE IN ACCORDANCE WITH NAVSEA DWG. 803-5184182.
 3. THIS FIGURE SUPERSEDES SHEET 4855 OF DRAWING 803-5001027.

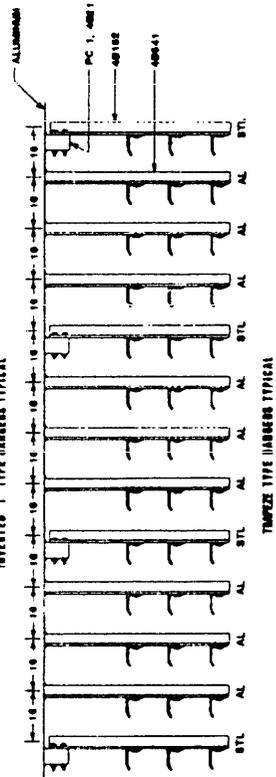
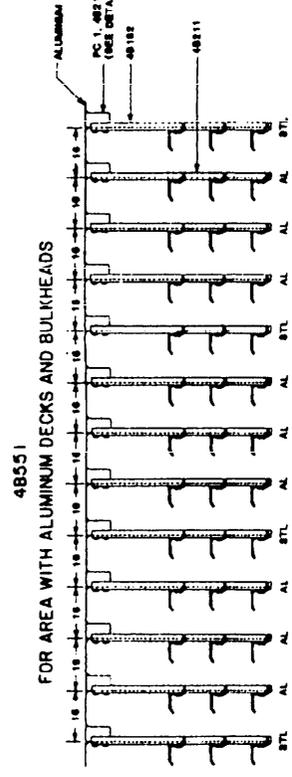


FIGURE 4B55. Spacing of multiple cableway supports for aluminum and steel decks and bulkheads (surface ships only).

SH 132317272

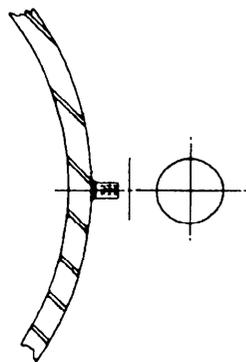
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NOTES:

1. METHODS SHOWN ON THIS SHEET ARE FOR USE WITH CABLES UP TO 2 IN. IN DIA. FOR CABLES GREATER THAN 2 IN. IN DIA. USE METHOD SHOWN ON FIGURE 4C2.
2. THIS FIGURE SUPERSEDES SHEET 4C1 OF DRAWINGS 803-5001027 AND SECTION 2, SHEET 186, OF DRAWING NAVSEC NO. 9000-S8202-731900.

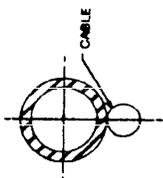
4C11

SINGLE CABLES ON STEEL STANCHIONS
HANGER SECURED WITH STUD.



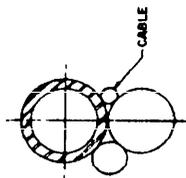
4C12

SINGLE CABLES ON SMALL STANCHIONS



4C13

TWO TO THREE CABLES ON
SMALL STANCHIONS



SH 132317273

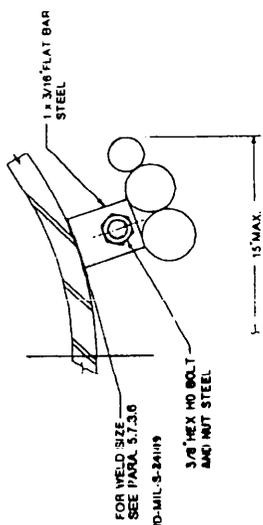
FIGURE 4C1. Single calisway on steel stanchions.

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NOTES
1. THIS FIGURE SUPERSEDES SHEET 4C2 OF DRAWING
803-5001027 AND SECTION 2, SHEET 204, OF DRAWING
NAVSEC NO 9000-SH203-73980.

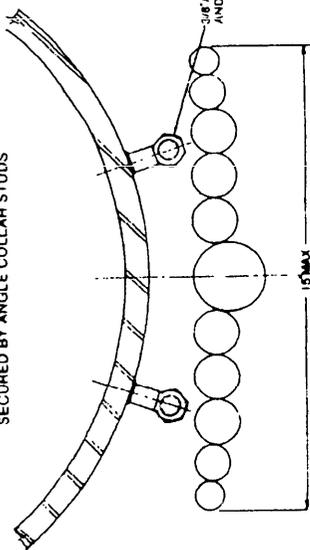
4C22

SINGLE TIER OF CABLES ON STEEL STANCHIONS
SECURED BY FLAT BAR



4C21

SINGLE TIER OF CABLES ON STEEL STANCHIONS
SECURED BY ANGLE COLLAR STUDS



SH 132317274

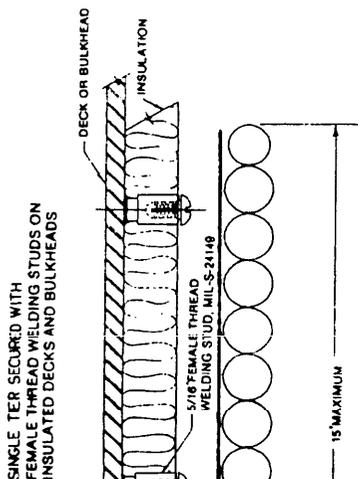
FIGURE 4C2. Single cableway on steel stanchion.

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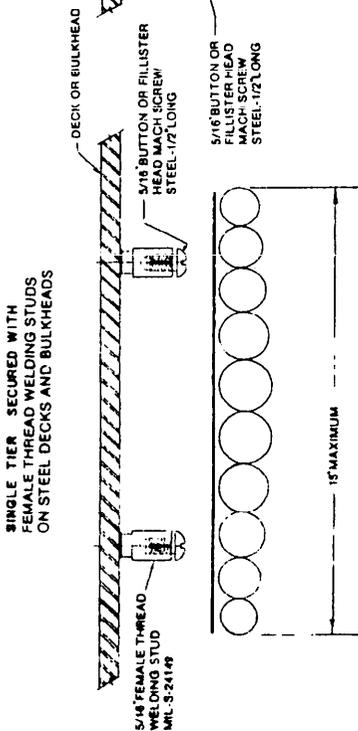
NOTES

- 1. METHODS SHOWN ON THIS FIGURE MAY BE USED IN LIEU OF THOSE SHOWN ON FIGURES 4C2, 4C3 & 4C14.
- 2. THIS FIGURE SUPERSEDES SHEET 4C4 OF DRAWING 803-500 1077 AND SECTION 2, SHEET 203, OF DRAWING NAVSEC NO. 9000-SR102-73980.

4C42

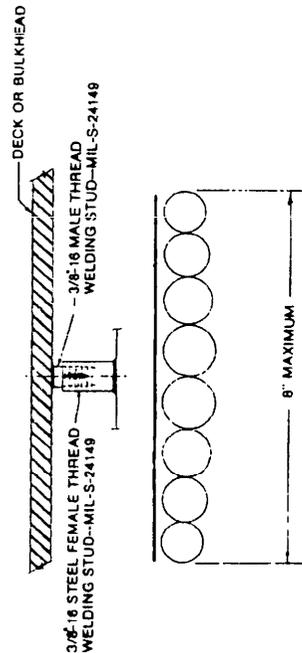


4C41



4C43

SINGLE TIER SECURED WITH WELD STUD ON STEEL DECKS AND BULKHEADS
MAXIMUM CABLE WEIGHT 10 POUNDS PER SUPPORT



SH 13231726

FIGURE 4C4. Single cableway on steel structure.

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NOTES

1. CRIMP-ON WELD-STUD TYPE CABLE HANGER SHOWN HEREON MAY BE USED AS ALTERNATES TO METHODS 4C72 AND 4C73.
2. WEIGHT OF CABLES SUPPORTED SHALL NOT EXCEED TWO POUNDS PER STUD FOR SINGLE-LOOP HANGER AND FOUR POUNDS PER STUD FOR A DUAL-LOOP HANGER SPACINGS BETWEEN STUDS SHALL NOT EXCEED 32 INCHES.
3. MAKE OF HANGERS PROCURED SHALL HAVE PASSED HIGH IMPACT SHOCK TEST, MIL-S-901, AND VIBRATION TEST, MIL-STD-167 USING THE MAXIMUM HANGER LOADINGS AND SPACING.
4. THE FEMALE WELD STUD METHOD SHOWN IN DETAIL "1" HEREON (ATTACHED TO EITHER THE CABLE STRAP OR SHIP'S STRUCTURE), MAY BE USED AS ALTERNATE TO METHODS 4C51 THROUGH 4C56.
5. THREADS WITH ALUMINUM MALE THREADS SHALL BE COATED.
6. THE CONTACT OF STEEL FEMALE THREADS WITH ALUMINUM MALE THREADS SHALL BE COATED WITH ANTI-SEIZE COMPOUND.
7. THE FEMALE WELD STUD METHOD SHOWN IN DETAIL "2" MAY BE USED AS ALTERNATE TO METHODS 4C71 AND 4C75 AND 4C51 THROUGH 4C56.
8. THIS FIGURE SUPERSEDES SHEET 4CS OF DWG. 8031-5001027 AND SECTION 2, SHEET 186, OF DRAWING, NAVSEC NO 9000-36202-73980.

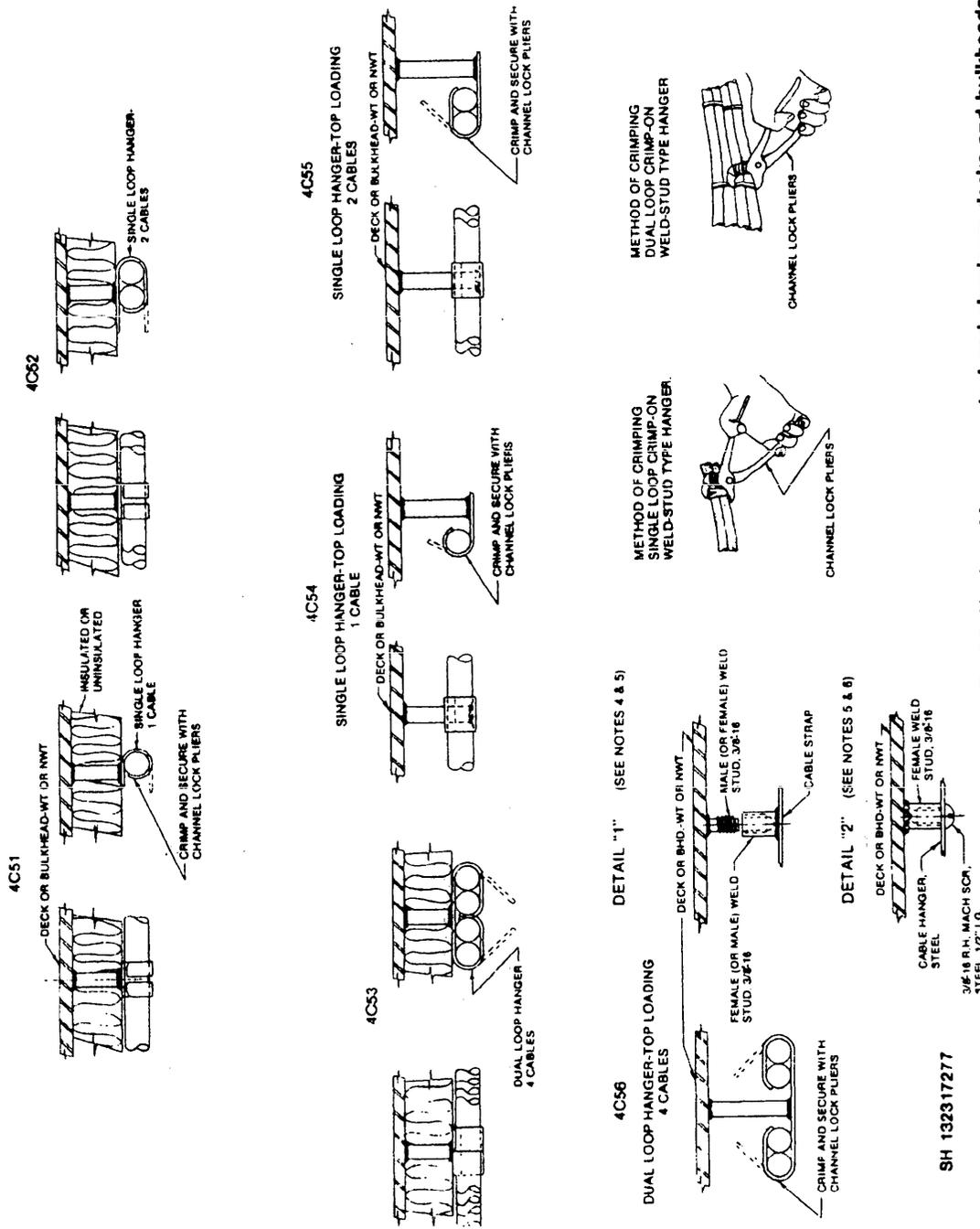


FIGURE 4C5 Single cableway on steel and aluminum decks and bulkheads.

SH 132317277

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NOTES

1. ALL HANGER MATERIAL SHALL BE THE SAME AS BULKHEAD MATERIAL
2. CABLE STRAP SHALL NOT DENT OR OTHERWISE EXERT PRESSURE ON THE SEMISOLID DIELECTRIC COAXIAL CABLES IN ANY OF THESE METHODS ADD SPACER WASHERS; IF NECESSARY TO KEEP CABLE FREE OF PRESSURE.
3. THIS FIGURE SUPERSEDES SHEET 406 OF DWG 803-5001027 AND SECTION 7, SHEETS 183 & 194, OF DRAWING, NAVSEC NO. 9000-94202-73490.

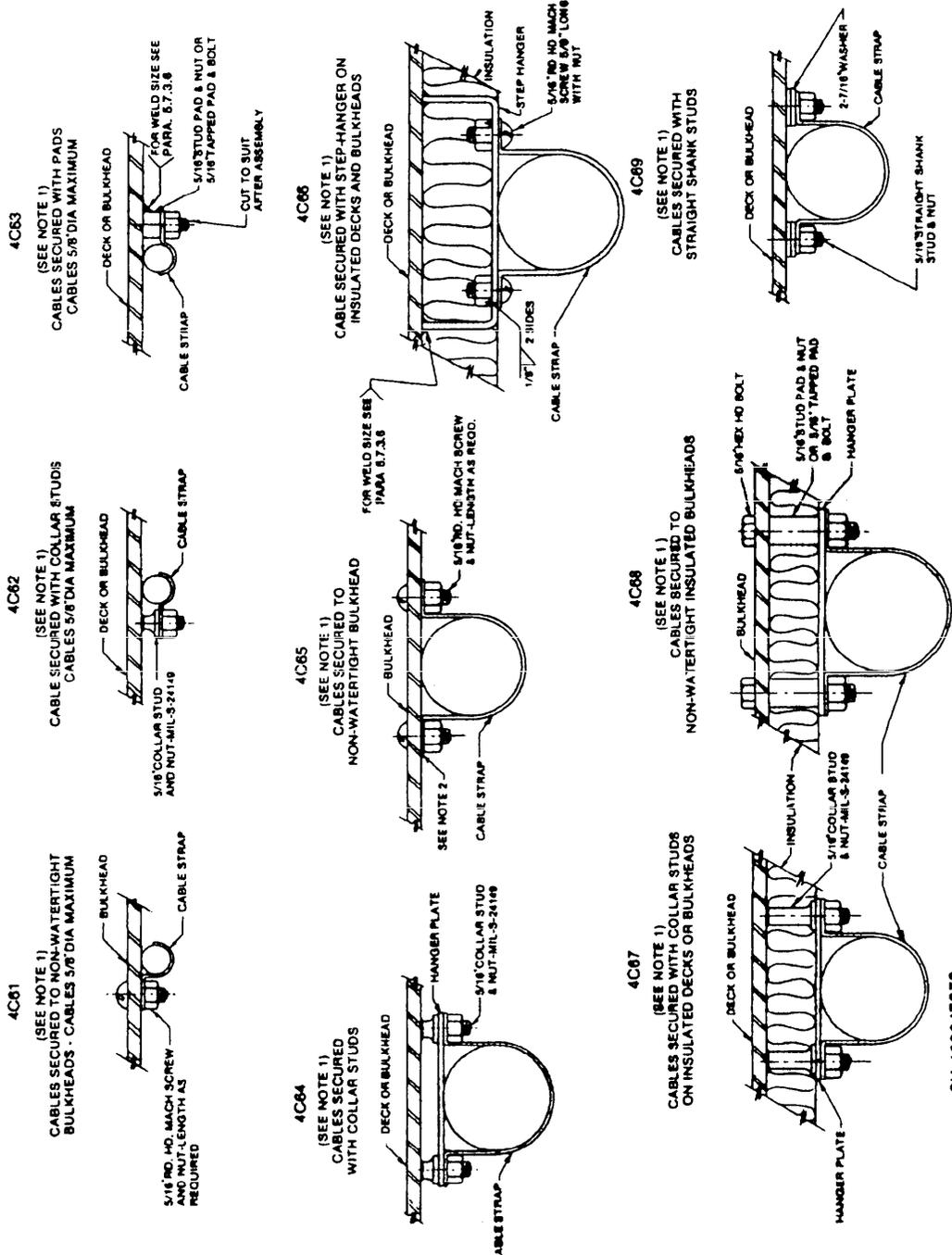
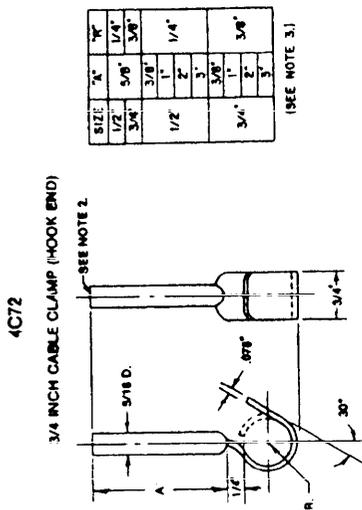


FIGURE 4C6. Single cableway for coaxial cable.

SH 132317278

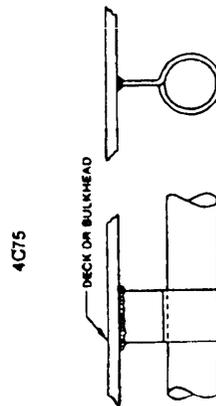
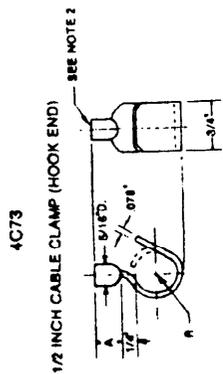
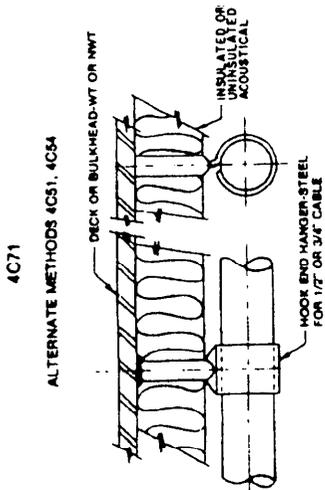
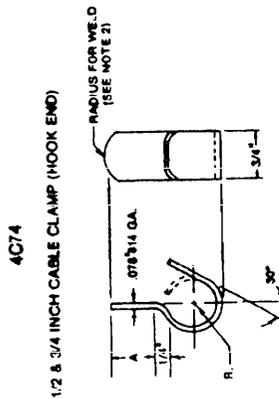
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- NOTES:
1. PIECES 4C72 THRU 4C74 SHALL BE UNPLATED UNLESS OTHERWISE SPECIFIED.
 2. HANGERS 4C72 THRU 4C74 SHALL BE SUITABLE FOR WELDING BY THE METAL ARC STUD WELDING PROCESS.
 3. THE APPLICABLE PC NO. AND SIZE SHALL BE STAMPED ON EACH HOOK END HANGER IN 1/8 INCH FIGURES.
 4. THIS FIGURE SUPERSEDES SHEET 4C7 OF DWG. 803-5001027 AND SECTION 1, SHEET 18, AND SECTION 2, SHEET 181 OF DRAWING NAVSPEC NO. 9000-98202-73980.



SIZE	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"	3"
	5/8"	3/8"	1"	1 1/4"	1"	1 1/2"	2"

(SEE NOTE 3.)



SH 132317279

FIGURE 4C7. Single cableway on steel and aluminum decks and bulkheads.

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- NOTES:
1. MINIMUM SPACING OF TUBES TO BE SUFFICIENT TO PERMIT SATISFACTORY WELDING.
 2. PLACE BEAD OF RTV SEALER OR EQUIVALENT ALL AROUND EDGE.
 3. THIS FIGURE SUPERSEDES SHEET 4C8 OF DRAWING 903-500 1027 AND SECTION 4, SHEET 21, OF DRAWING NAVSEC NO. 9000-SB202-73990.

4C81

MULTIPLE TIERS OF CABLES THROUGH LIGHT BULKHEAD WITH AIR AND FUME TIGHTNESS REQUIREMENTS

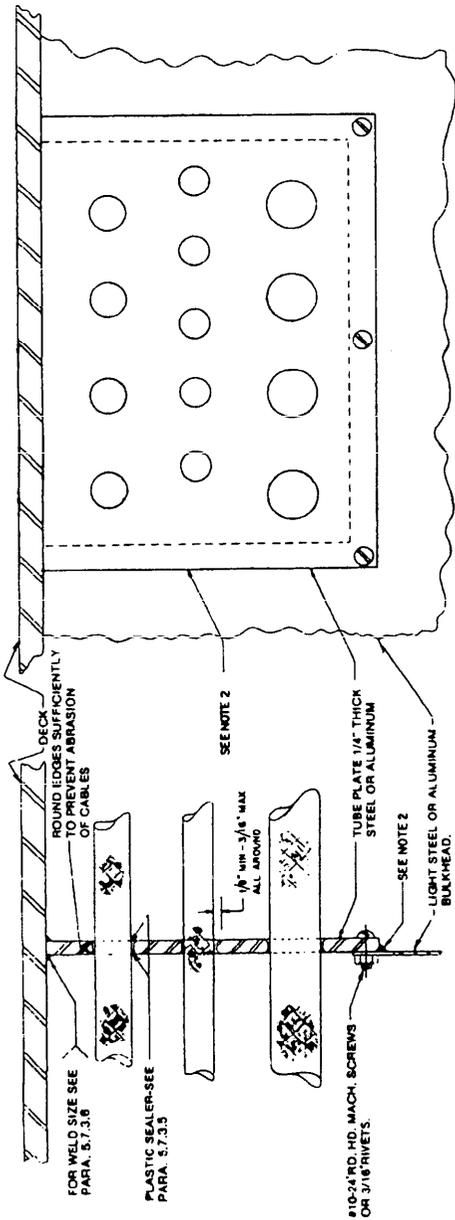


FIGURE 4C8. Cableway through non-water-tight bulkheads & beams without firestops.

SH 1323 17280

DOD-STD-2003-4 (NAVY)
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- NOTES:
1. MINIMUM SPACING OF TUBES TO BE SUFFICIENT TO PERMIT SATISFACTORY WELDING.
 2. CHAFING NIPPLES USED TO PROTECT CABLES PASSING THRU BULKHEADS SHALL BE WELDED ON ONE SIDE OF THE BULKHEAD PENETRATED, EXCEPT FOR THE FOLLOWING TYPES OF BULKHEADS WHERE WELDS ON BOTH SIDES ARE REQUIRED:
 - A. BALLISTIC BULKHEADS
 - B. SHELL PLATING
 - C. TORPEDO DEFENSE BULKHEADS
 3. THIS FIGURE SUPERSEDES SHEET 4C9 OF DRAWING 803-6001027 AND SECTION 4, SHEET 20, OF DRAWING NAVSEC NO. 9000-38202-73986.

4C91

MULTIPLE TIERS OF CABLES THROUGH BULKHEADS
WITH AIR AND FUME TIGHTNESS REQUIREMENTS
CABLES THROUGH TUBING

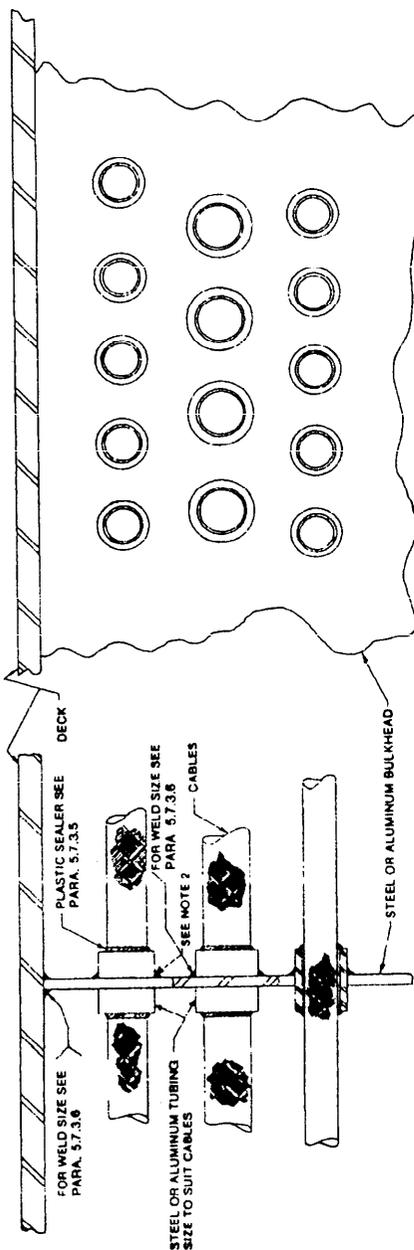


FIGURE 4C9. Cableway through non-waterlight bulkheads & beams without firestops.

SH 132317281

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NOTES:

1. WHEN HOLES ARE CUT IN SHIPS STRUCTURE SOLELY FOR THE PASSAGE OF CABLES, THE LINER SHALL BE OF SUFFICIENT WEIGHT TO COMPENSATE FOR THE LOSS OF STRENGTH DUE TO THE METAL REMOVED.
2. LINERS 1/16" THICK CAN BE USED AS AN ALTERNATE TO HALF ROUND BAR.
3. INSTALLATION OF LINER IN BEAMS MAY BE MADE IN SHOP OR IN THE SHIP.
4. WHERE NO LIGHTENING HOLES ARE PROVIDED, CABLES ARE TO BE INSTALLED IN BEAMS WHEN NO INTERFERENCE WITH EITHER EQUIPMENT OR NORMAL HEADROOM RESULTS.
5. THIS FIGURE SUPERSEDES SHEET 4C10 OF DRAWING 803-5001027 AND SECTION 4, SHEET 19, OF DRAWING NAVSEC NO 9000-38202-73980.

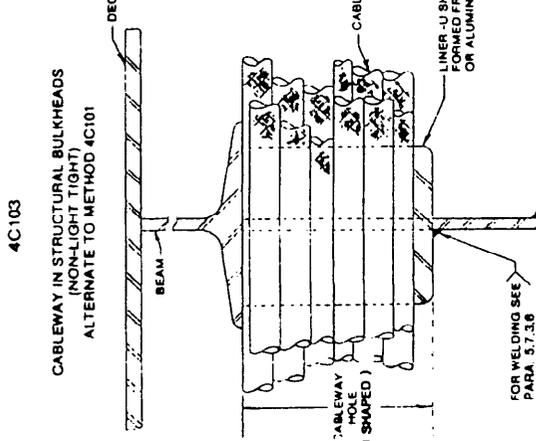
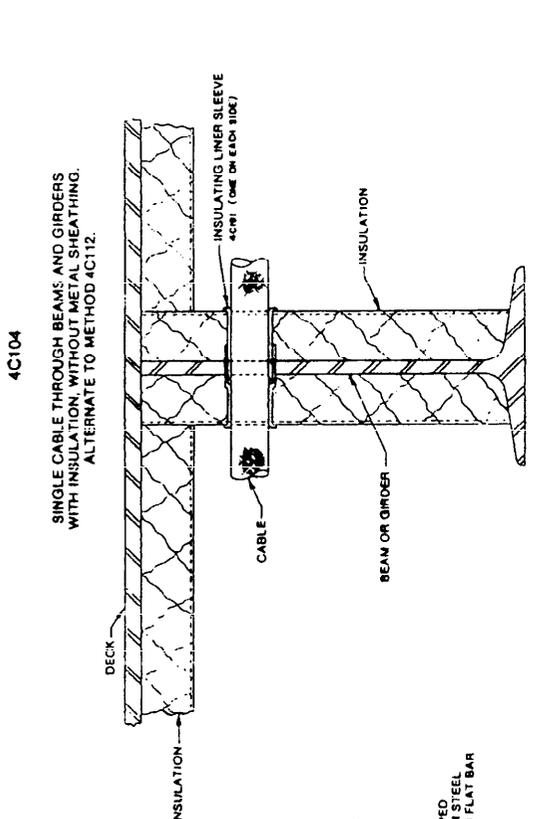
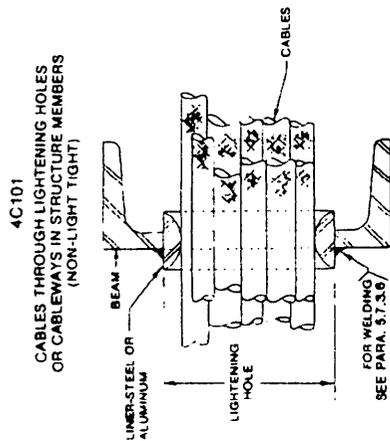
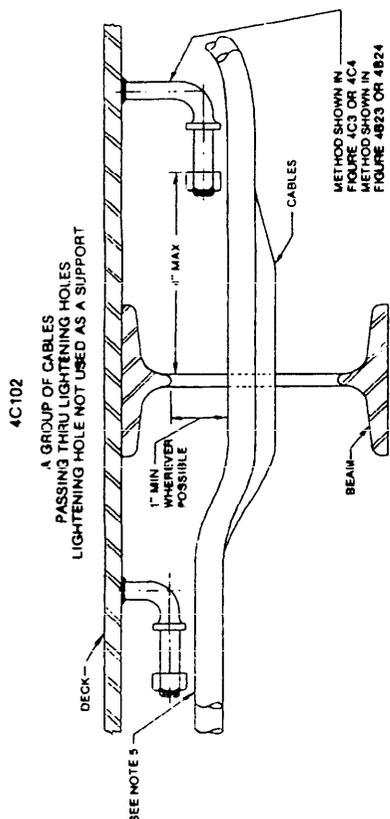


FIGURE 4C10. Cableway through iron-waterlight bulkheads & beams without firestops.

SH 132317282

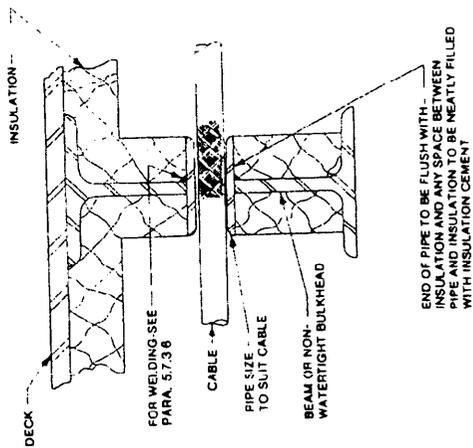
DOD-STD-2003-4 (NAVY)
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NOTES

1. WHEN CABLES PIERCE NON-WATERTIGHT BULKHEADS REQUIRED TO BE LIGHT - TIGHT THE SPACE BETWEEN THE CABLE AND INSIDE OF THE BUSHING TUBING OR DRILLED HOLE SHALL BE THOROUGHLY PACKED WITH PLASTIC SEALER SPECIFICATION MIL-T-3064, TYPE HF TO FORM A PERMANENT LIGHT-TIGHT SEAL.
2. INSTALLATION OF LINER IN BEAMS MAY BE MADE IN SHOP OR IN THE SHIP.
3. WHERE NO LIGHTENING HOLES ARE PROVIDED, CABLES MAY BE RUN OUTSIDE OF BEAM WHEN NO INTERFERENCE WITH EITHER EQUIPMENT OR NORMAL HEADROOM RESULTS.
4. DELETED
5. DELETED
6. THIS FIGURE SUPERSEDES SHEET 4C11 OF DRAWING 803-5001027 AND SECTION 4, SHEET 16, OF DRAWING, NAVSEC NO 9000-96202-73#80.

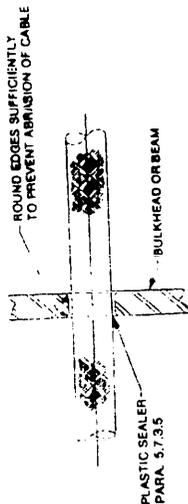
4C112

INSULATED BULKHEAD OR BEAM
CABLE THROUGH TUBING



4C111

CABLES THROUGH BULKHEADS AND BEAMS
1/4" THICKNESS AND OVER



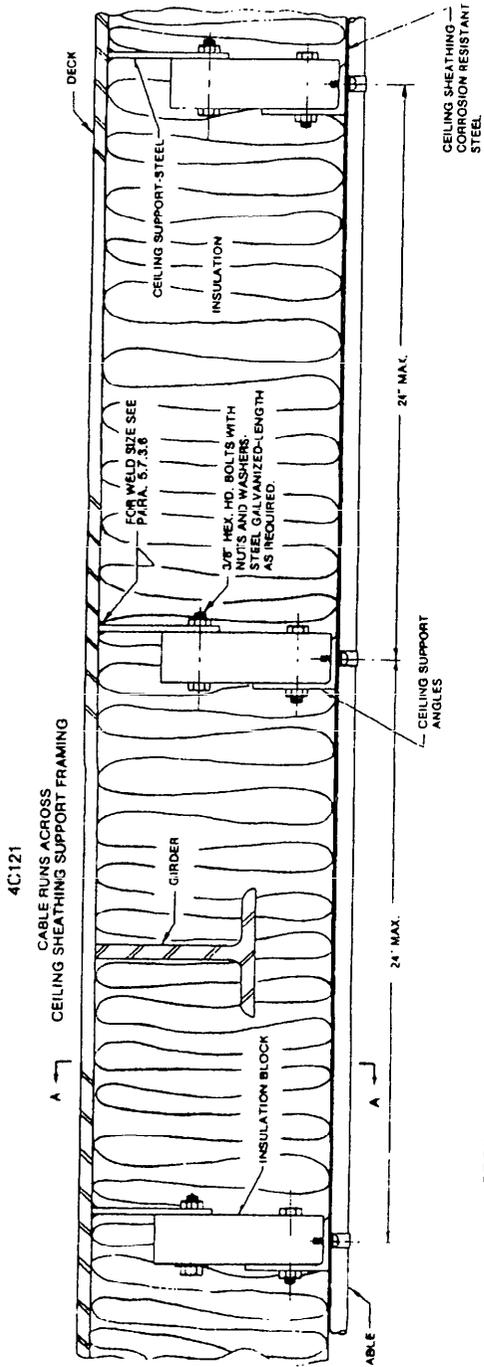
SH 132317283

FIGURE 4C11. Cableway through non-watertight bulkheads and beams without firestops.

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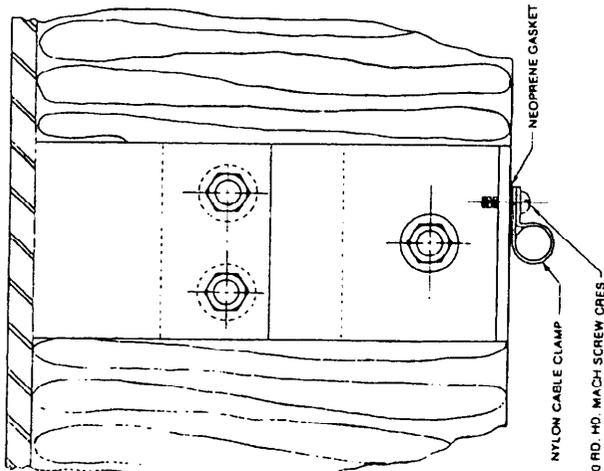
NOTES

1. THIS FIGURE SUPERSEDES SHEET 4C12 OF DWG. 803-5001027 AND SECTION 2 SHEET 119 OF DRAWING NAVSEC NO. 9000-58202-73880.



SECTION A-A

INTERMEDIATE SUPPORT

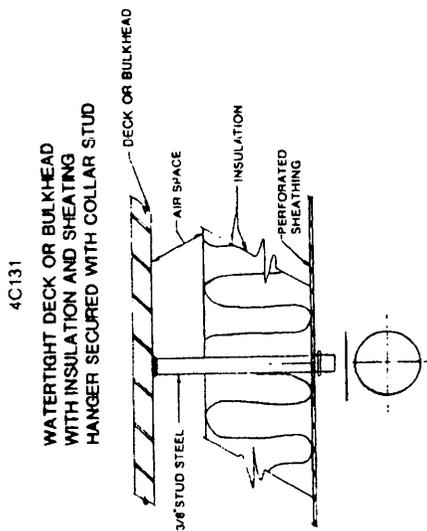


SH 132317284

FIGURE 4C12. Single cableway in refrigerated spaces.

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- NOTES:
1. METHODS SHOWN ON THIS FIGURE ARE FOR USE WITH CABLE UP TO 2 IN. IN DIA FOR CABLES GREATER THAN 2 IN. IN DIA, USE METHODS SHOWN ON FIGURE 4C14.
 2. THIS FIGURE SUPERSEDES SHEET 4C13 OF DRAWING 803-5001027 AND SECTION 2, SHEET 103 OF DRAWING NAVSEC NO. 8000-S8702-13880.

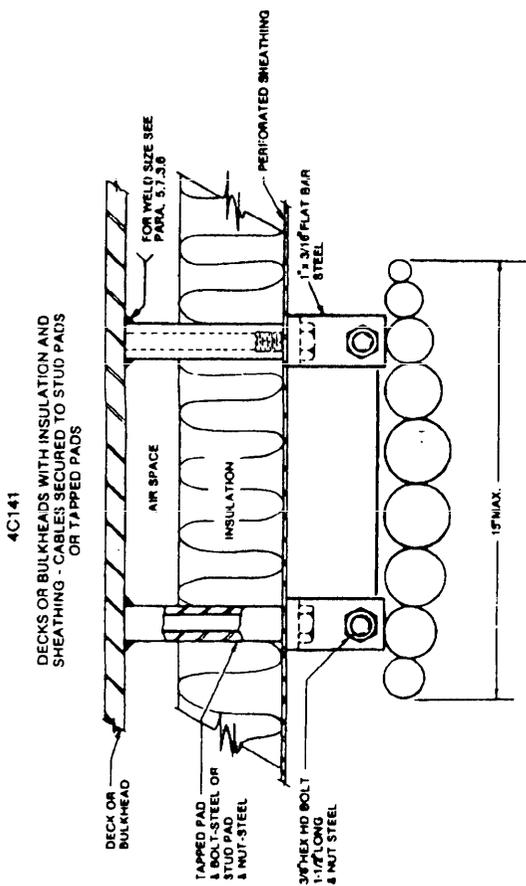


SH 132317285

FIGURE 4C13. Single cableways in acoustical spaces.

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NOTES:
1. THIS FIGURE SUPERSEDES SHEET 4C14 OF DRAWING
803 5001027 AND SECTION 2, SHEET 105, OF DRAWING
NAVSEC NO. 9000-36232-73980.



SH 132317286

FIGURE 4C14. Single cableways in acoustical spaces.

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NOTES:
1. THIS FIGURE SUPERSEDES SHEET 4C15 OF DRAWING
803-500 1027 AND SECTION 3, SHEET 19, OF DRAWING
NAVSEC NO. 9000-98202-1-3860.

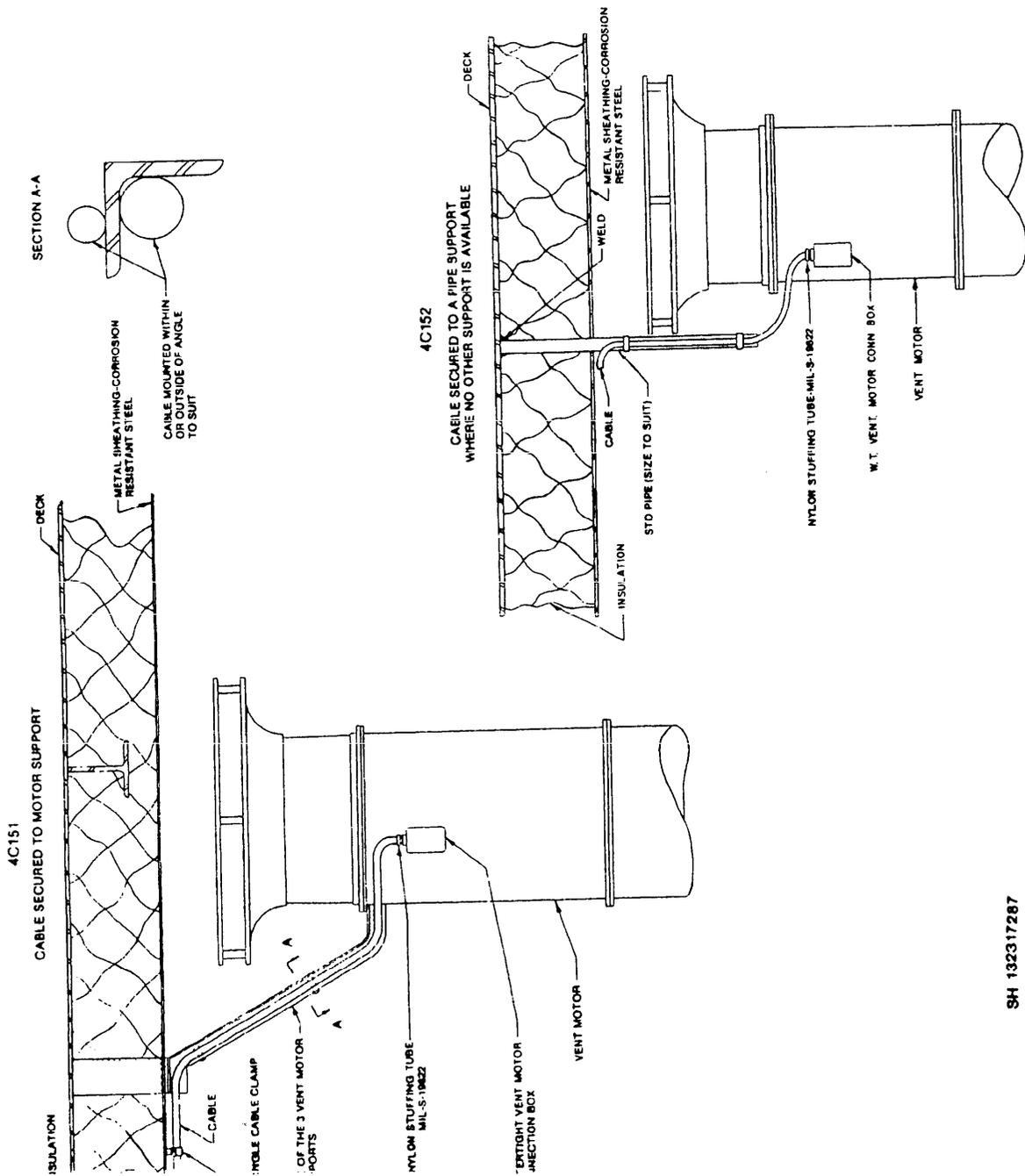
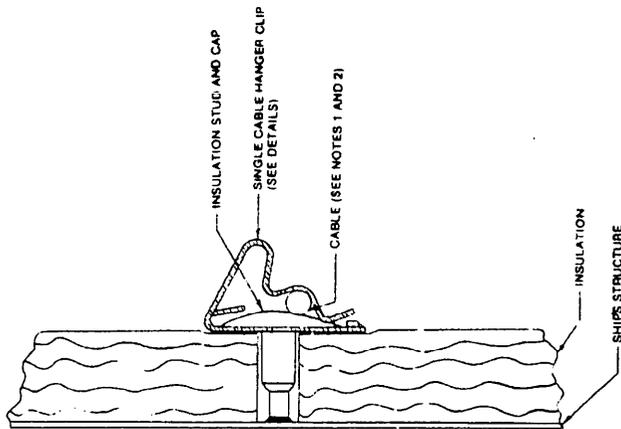


FIGURE 4C15. Single cableway to motors.

SH 132317287

METHOD 4C161

SINGLE CABLE HANGER CLIP USED IN CONJUNCTION WITH INSULATION STUD CAP



NOTES:

1. THIS HANGER CLIP IS FOR CABLE 1/2" IN DIAMETER OR LESS AND WEIGHING 1/4 POUND PER FOOT OR LESS.
2. WHERE A MAXIMUM LENGTH OF THE CABLE RUN IS INSTALLED ALONG THE SURFACE OF THE HULL BOARD INSULATION AND IT IS NECESSARY TO ORIGINATE OR TERMINATE THE RUN OUTSIDE THE INSULATION BOUNDARY, THIS HANGER MAY BE USED FOR CONTINUATION OF THE RUN IF ADVANTAGEOUS TO DO SO.
3. MATERIAL: SPRING STEEL, SPHEROIDIZED, ASI C-1070, ROCKWELL HARDNESS 45-55, ZINC ELECTRO-PLATED, SPEC ASTM-B-633, TYPE, CLASS 9C2.
4. THIS FIGURE SUPERSEDES SHEET 4C16 OF DRAWING 803-5001027 AND SECTION 2, SHEET 197, OF DRAWING NAVSEC NO. 9000-36202-73980.

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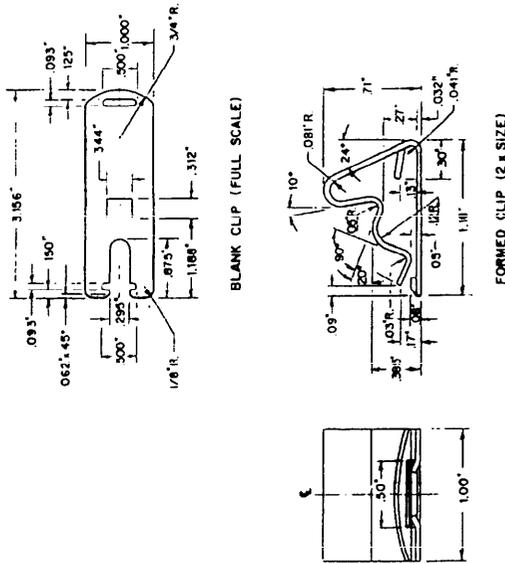
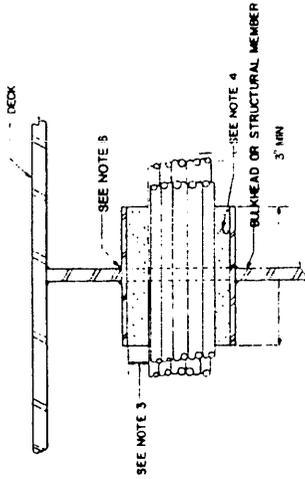


FIGURE 4C16. Single cableway on hullboard insulation.

SH 132317288

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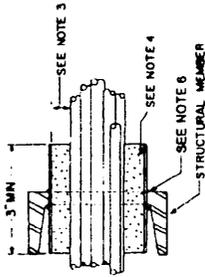
4 C173
MULTIPLE CABLE PENETRATION THRU NON-WATERTIGHT BULKHEADS
OR STRUCTURAL MEMBERS WITH FIRE STOP



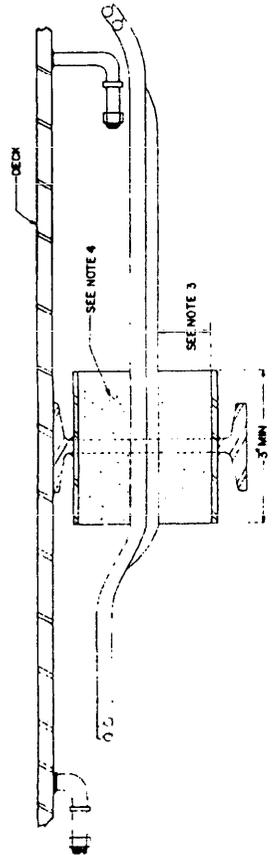
NOTES:

- 1 FIRE STOP METHODS ARE FOR NON-WATERTIGHT CABLE PENETRATIONS AND ALSO FOR AIRTIGHT AND FLAME-TIGHT SPACES WHEN APPLICABLE.
- 2 STUFFING UNITS (TUBING, COLLARS AND LINERS) SHALL BE STEEL FOR STEEL STRUCTURES AND ALUMINUM FOR ALUMINUM STRUCTURES.
- 3 MINIMUM CLEARANCE SPACE AROUND CABLES BEFORE PACKING SHALL BE 1/4 INCH FOR SINGLE CABLES AND 1/2 INCH FOR MULTIPLE CABLES.
- 4 PACK THOROUGHLY AROUND AND BETWEEN CABLES WITH PLASTIC SEALER MIL-3-3064 TYPE HF.
- 5 STUFFING UNIT MAY BE ATTACHED BY ALL AROUND WELD TACK WELD OR FASTENERS PROVIDED THAT THE ATTACHMENT CONFORMS TO THE STRUCTURAL AND TIGHTNESS REQUIREMENTS OF THE BULKHEAD OR MEMBER TO WHICH IT IS ATTACHED.
- 6 ALL WELDING SHALL BE IN ACCORDANCE WITH PARA 5.7.3.6.
- 7 THIS FIGURE SUPERSEDES SHEET 4C17 OF DRAWING NO. 803-5001027

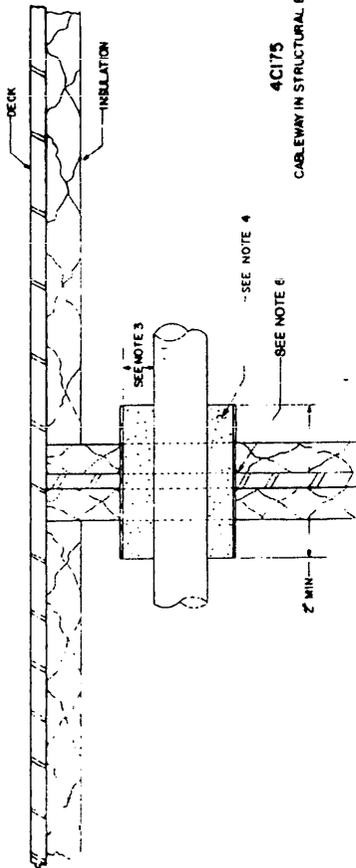
4 C174
MULTIPLE CABLE PENETRATION THRU
STRUCTURAL MEMBER WITH FIRE STOP



4 C171
CABLES PASSING THRU LIGHTENING HOLES WITH FIRE STOP



4 C172
SINGLE CABLE PENETRATION THRU NON-WATERTIGHT BULKHEADS OR
STRUCTURAL MEMBERS WITH FIRE STOP



4 C175
CABLEWAY IN STRUCTURAL BULKHEADS

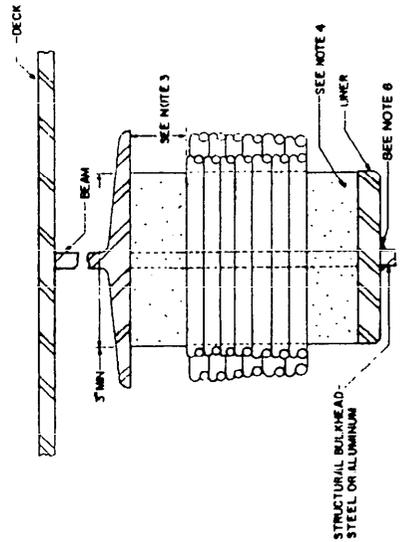


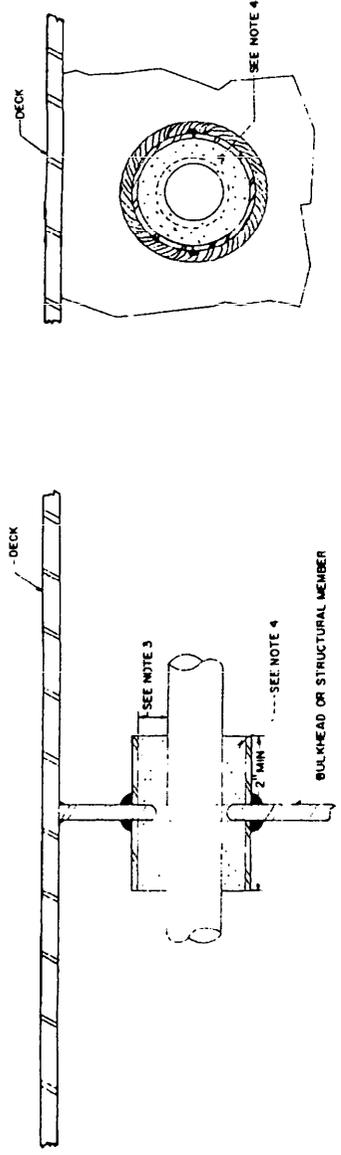
FIGURE 4C17. Cableway through non-watertight bulkheads and beams with fire stops.

SH 132317289

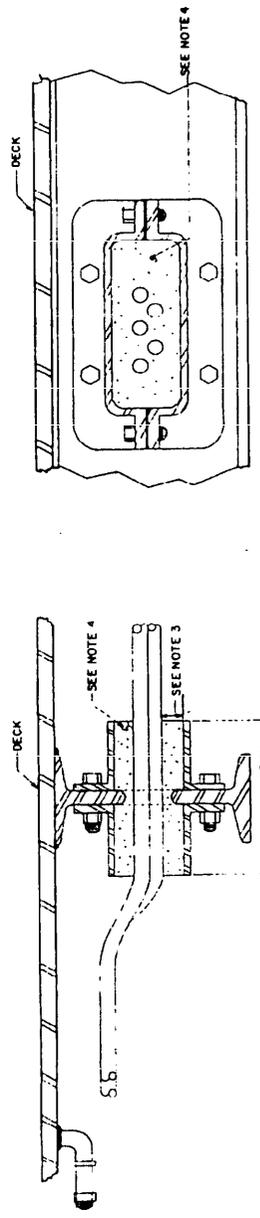
- NOTES:
1. FIRE STOP METHODS ARE FOR NON-WATER TIGHT CABLE PENETRATIONS AND ALSO FOR AIR TIGHT AND FUMETIGHT STUFFING UNITS (TUBING, COLLARS, AND LINERS) SHALL BE STEEL FOR STEEL STRUCTURES AND ALUMINUM FOR ALUMINUM STRUCTURES.
 2. MINIMUM CLEARANCE AND SPACE AROUND CABLES BEFORE PACKING SHALL BE 1/4" INCH FOR SINGLE CABLES AND 1" INCH FOR MULTIPLE CABLES.
 3. PACK THOROUGHLY AROUND AND BETWEEN CABLES WITH PLASTIC SEALER MIL-1-3064, TYPE HF.
 4. STUFFING UNIT MAY BE ATTACHED BY ALL AROUND WELD, TACK WELD, OR FASTENERS PROVIDED THAT THE ATTACHMENT CONFORMS TO THE STRUCTURAL AND TIGHTNESS REQUIREMENTS OF THE BULKHEADS OR MEMBERS TO WHICH IT IS ATTACHED.
 5. FOR EXISTING INSTALLATIONS STUFFING UNITS MAY BE SPLIT LENGTHWISE FOR INSTALLING OVER CABLE.
 6. ALL WELDING SHALL BE IN ACCORDANCE WITH PARA 6.7.3.6.
 7. THIS FIGURE SUPERSEDES SHEET 4C18 OF DRAWING NO. 803-5001027.

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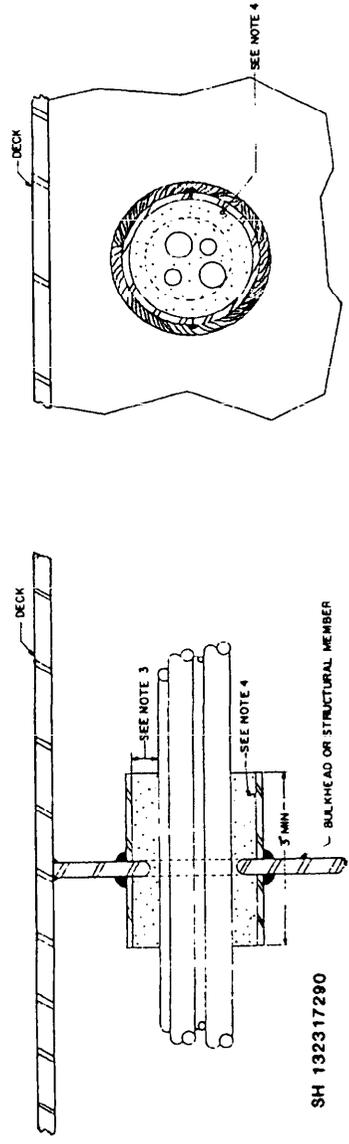
4C181
SINGLE CABLE PENETRATION THRU NON-WATERTIGHT BULKHEADS OR STRUCTURAL MEMBERS WITH FIRE STOPS.



4C182
CABLE PASSING THRU LIGHTENING HOLES WITH FIRE STOPS
MULTIPLE CABLE PENETRATION



4C183
MULTIPLE CABLE PENETRATION THRU NON-WATERTIGHT BULKHEADS OR STRUCTURAL MEMBERS WITH FIRE STOPS

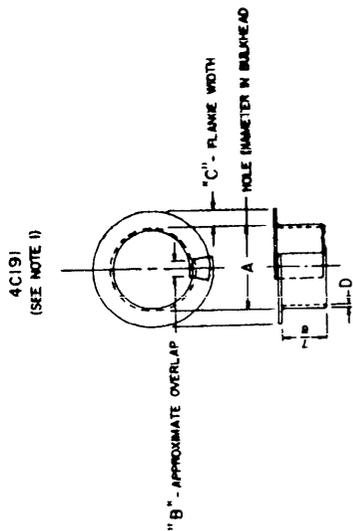


SH 132317290

FIGURE 4C18. Cableways through non-watertight bulkheads with fire stops (existing cable penetrations).

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- NOTES:
1. THESE LINERS MAY BE OF COMMERCIAL SIZES. THE MATERIAL SHALL BE OF VULCANIZED FIBER OR OTHER PLASTIC MATERIAL OF NON-TOXIC TYPE.
 2. REFER TO METHOD 4CJ4.
 3. THIS FIGURE SUPERSEDES SHEET 4C19 OF DRAWING NO. 803-5001027 AND SECTION 1, SHEET 85 OF DRAWING. NAVSEC NO 8000-36202-73890.



A	B	C	D
1-5/32	3/16	1/8	.083
1-7/16	3/16	5/32	.085
1-5/8	1/4	5/32	.090
2-1/16	1/4	5/32	.090
2-8/32	5/16	5/32	.090
3-3/8	3/8	7/32	.040
3-3/8	3/8	7/32	.040
3-1/4	7/16	7/32	.040
3-1/4	3/8	1/8	.085

FIGURE 4C19. Insulating liners for cable holes in beams & girders.

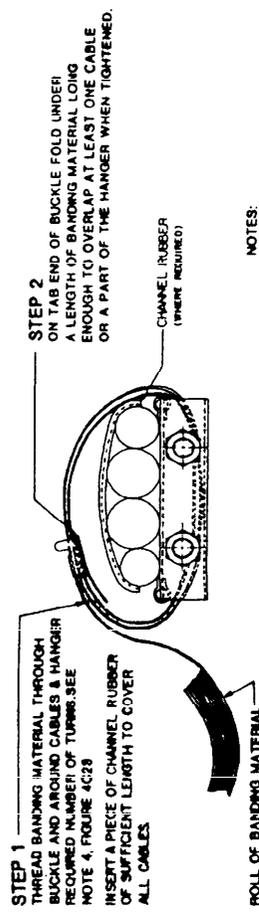
DOD-STD-2003-4 (NAVY)
24 June 1987

THIS SHEET LEFT
INTENTIONALLY BLANK

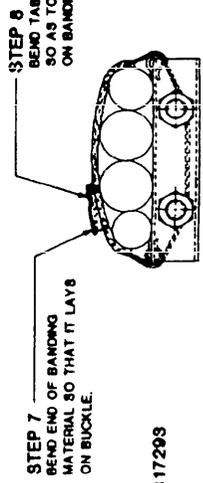
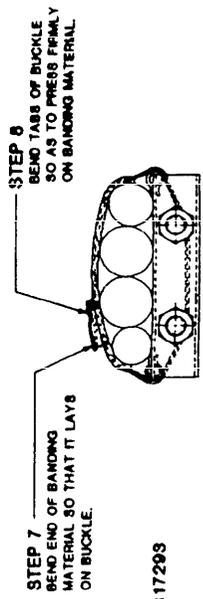
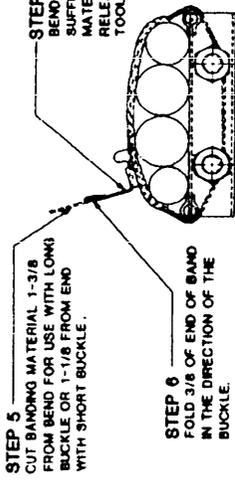
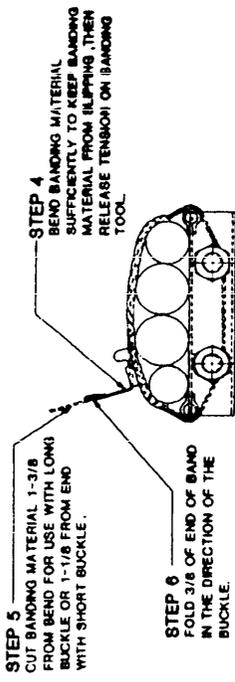
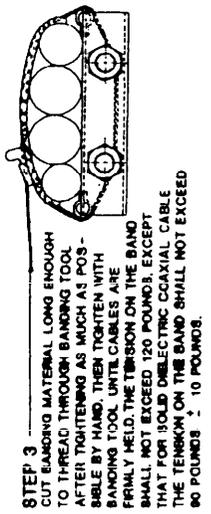
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STRAPPING MATERIAL			
PIECE NUMBER	MATERIAL	WIDTH THICKNESS	SPECIFICATIONS FINISH
4C221	MILD STEEL	5/8 .015	OO-S-781 TYPE 1 ZINC CLASS B, GRADE ELECTRO-PLATED
4C222	CRCS.	5/8 .015	ML-S-17896 CLASS 1 2D
4C223	ALUMINUM	5/8 .025	OO-A-327 TEMPER T6 NONE
4C224	MILD STEEL	5/8 .020	OO-S-781 TYPE 1 ZINC CLASS B, GRADE ELECTRO-PLATED
4C225	CRCS.	5/8 .020	ML-S-17896 CLASS 1 2D

CHANNEL RUBBER		
PIECE NUMBER	MATERIAL	SPECIFICATIONS
4C226	RUBBER	7/8 W x 3/8 CH x 5/16 H MIL R 6805 CL 2, GR 60



NOTES:
1. THIS FIGURE SUPERSEDES SHEET 4C22 OF DRAWING 803-5001027.



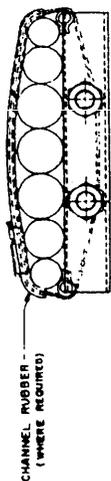
SH 132317203

FIGURE 4C22. Applying banding material.

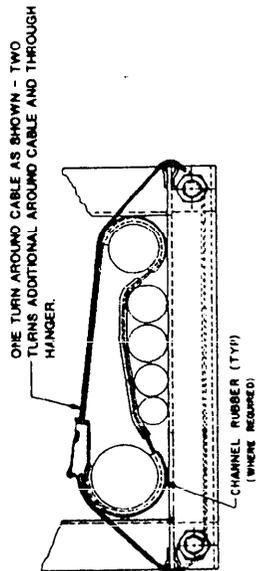
NOTES

1. FOR FULLY LOADED HANGERS (WHERE HANGER WIDTH DOES NOT EXCEED THE WIDTH OF A SINGLE CABLE, OR A SINGLE ROW OF CABLES BY MORE THAN 1/2 INCH) USE METHOD 4C231.
2. FOR PARTIALLY LOADED HANGERS (WHERE HANGER WIDTH EXCEEDS THE WIDTH OF A SINGLE CABLE OR A SINGLE ROW OF CABLES BY MORE THAN 1/2 INCH) USE METHOD 4C232.
3. THE LENGTH OF BANDING HANGER SHALL NOT BE LESS THAN THE OVERALL WIDTH OF CABLES FOR A SINGLE CABLE OR A ROW OF CABLES.
4. BAND REQUIREMENTS ARE AS FOLLOWS:
SINGLE CABLES 1 IN. DIA. AND UNDER - .015 THICK - 1 TURN, SINGLE CABLES OVER 1 IN. DIA. - .015 THICK - TWO TURNS
MULTIPLE CABLES 2 IN. DIA. AND UNDER - .015 THICK - 2 TURNS, MULTIPLE CABLES OVER 2 IN. DIA. - .015 THICK, 3 TURNS OR .020 IN. THICK, 2 TURNS
5. CABLES SHOULD BE ARRANGED SO THAT THE LARGER CABLES ARE IN THE CENTER OF THE HANGER, IF POSSIBLE.
6. IN NONMAGNETIC MINESWEEPERS USE CREB BAND EXCEPT THAT ALUMINUM BAND ITEM 4C223 (.025 THICK) MAY BE USED WHERE CABLES ARE UNDER 2 IN. IN DIA. AND HANGER SPACING IS 2 1/4 INCHES ON CENTER, MAXIMUM.
7. FOR WEATHER DECKS USE CREB BAND, SIZES AS PER NOTE 4.
8. THE BANDING METHOD SHALL BE USED TO SUPPORT COAXIAL CABLES EXCEPT COAXIAL CABLES OF THE SEMI-SOLID DIELECTRIC TYPE.
9. SEMI-SOLID DIELECTRIC COAXIAL CABLES SHALL BE SUPPORTED BY THE CONTOUR STRAP METHODS, SUCH AS METHODS 8 ON FIGURE 4C8.
10. CHANNEL RUBBER SHALL BE INSTALLED AROUND ARMORED CABLES TERMINATING AT SOUND ISOLATED EQUIPMENT.
11. THIS FIGURE SUPERSEDES SHEET 4C23 OF DRAWING 803-5001027.

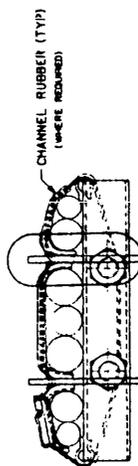
FULLY LOADED HANGERS 4C231



HANGERS WITH LARGE & SMALL CABLES INTERMIXED 4C233



PARTIALLY LOADED HANGERS 4C232



USE OF CHANNEL RUBBER FOR SOUND ISOLATION (SEE NOTE 10)

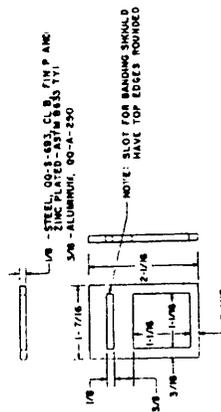
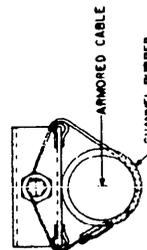


FIGURE 4C23. Details of partially and full loaded banding hangers.

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NOTES:
1. ALUMINUM AND STEEL ANGLES MAY BE PURCHASED IN
SPECIAL LENGTHS AND CUT TO THE DIMENSIONS
REQUIRED FOR THE COMPONENT PARTS OF AN
INSTALLATION.
2. THIS FIGURE SUPERSEDES SHEET 4C24 OF DRAWING
803-5001027.

MATERIAL:
ANGLE HANGER SUPPORTS SHALL BE ALUMINUM ALLOY
6061-T6 OR STEEL COMMERCIAL GRADE.

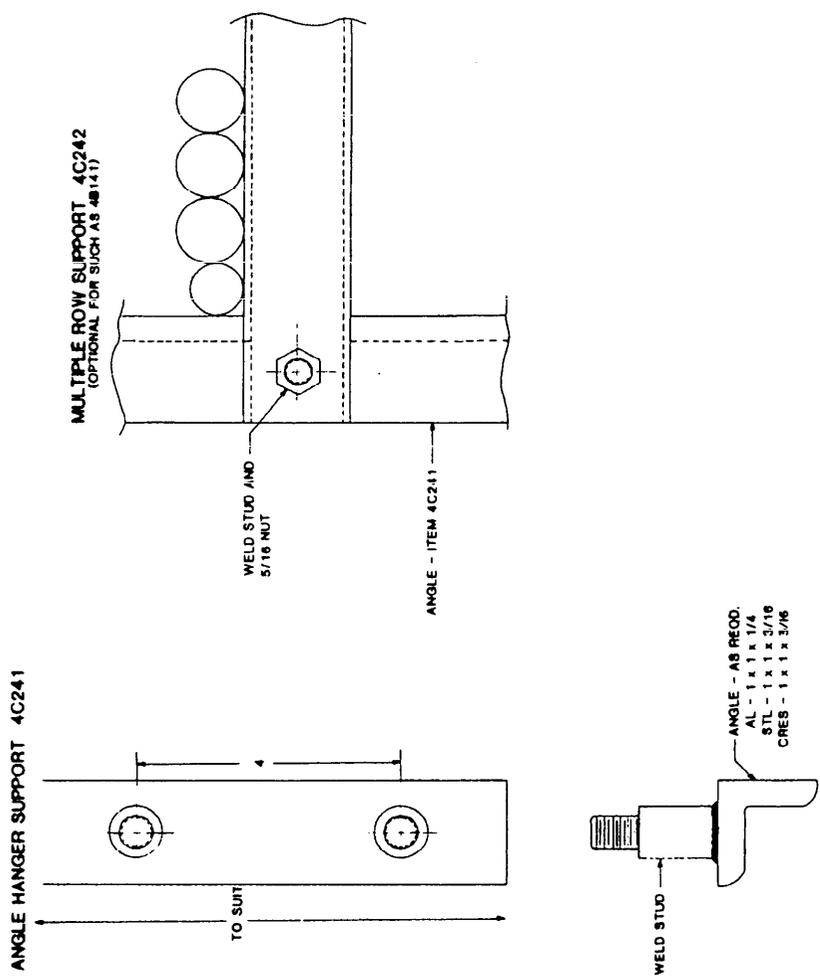


FIGURE 4C24. Angle hangers support details.

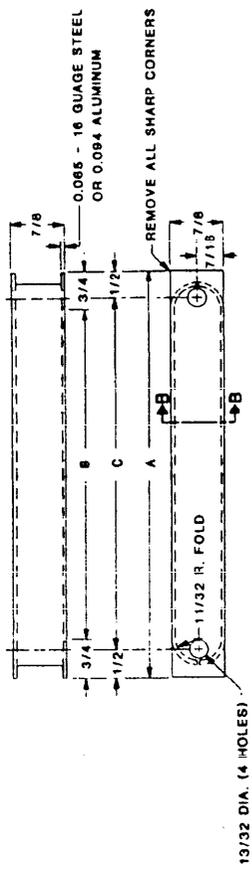
SH 132317295

DOD-STD-2003-4 (NAVY)
24 JUNE 1987

- NOTES:
1. SQUARE TUBING MAY BE PURCHASED IN COMMERCIAL LENGTHS.
 2. CUT TUBULAR HANGERS TO THE LENGTHS REQUIRED IN TABULATIONS
 3. TUBULAR HANGERS SHOWN HEREON MAY BE USED AS ALTERNATE TO TUBULAR HANGERS FERRULES NOT REQUIRED.
 4. THIS FIGURE SUPERSEDES SHEET 4C25 OF DWG 803-5001027

4C251 - ALUMINUM
4C252 - STEEL
4C253 - CRES

SIDE MOUNTED TUBULAR HANGER (SEE NOTE 3)



0.156 OUTSIDE RADIUS

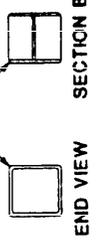


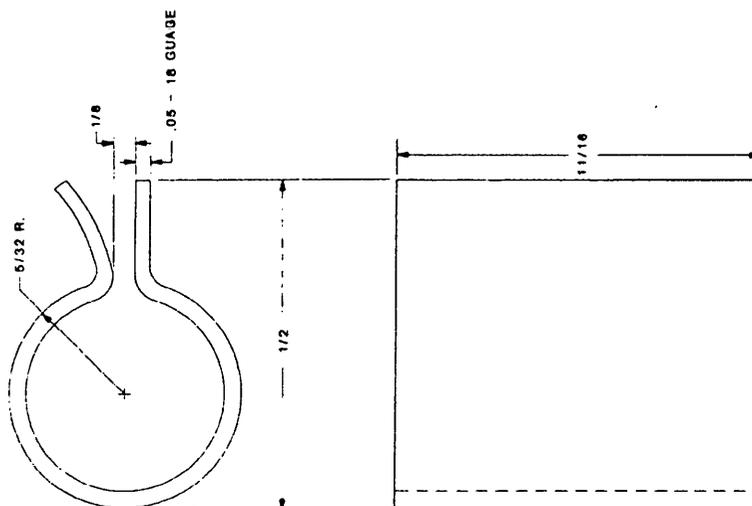
TABLE OF DIMENSIONS

ITEM NO.	LENGTH	END B DIM.	MOUNTING DIM. C
3	1-1/2	2	
4	2-1/2	3	
5	3-1/2	4	
6	4-1/2	5	
7	5-1/2	6	
8	6-1/2	7	
9	7-1/2	8	
10	8-1/2	9	
11	9-1/2	10	
12	10-1/2	11	
13	11-1/2	12	
14	12-1/2	13	
15	13-1/2	14	
16	14-1/2	15	
17	15-1/2	16	

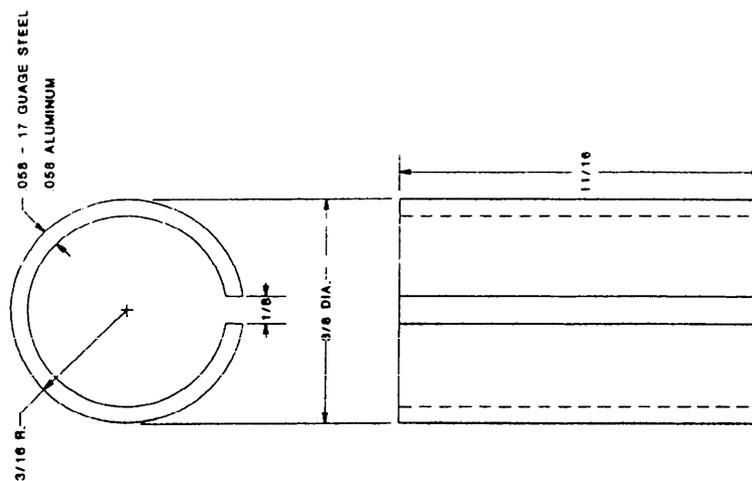
FIGURE 4C25: Details of tubular hanger.

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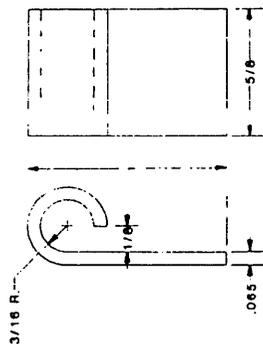
4C261 - ALUMINUM
4C262 - MILD STEEL
4C263 - CRES
FERRULE
(SEE NOTES 2 & 3)



4C264 - STEEL
4C465 - ALUMINUM
FERRULE
(SEE NOTES 2 & 3)



4C266 - STEEL
FERRULE
(SEE NOTE 2)



NOTES:

1. FERRULES SHALL BE FORMED OR EXTRUDED STEEL, ALUMINUM OR NYLON, COMMERCIAL GRADE.
2. FERRULES, ITEMS 4C264 OR 4C266, MAY BE USED AS ALTERNATES TO ITEM 4C262.
3. FERRULE, ITEM 4C265, MAY BE USED AS AN ALTERNATE TO ITEM 4C261.
4. THIS FIGURE SUPERSEDES SHEET 4C26 OF DWG. 803-5001027.

FIGURE 4C26. Tubular banding hangers ferrule details.

SH 132317287

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NOTES

1. LENGTH AND WIDTH OF ENCLOSURE TO SUIT CABLE GROUP. THE SIZE OF THE STUFFING TUBE GROUP IN DECKS AND BULKHEADS SHALL BE LIMITED SUCH AS TO PERMIT RETIGHTENING OF ALL GLAND NUTS IN THE GROUP BY SHIPS FORCE USING STUFFING TUBE WRENCH SET PER SPEC. GGD-W-946, TYPE II, CLASS I, STYLE A POLICE, TABLE VI (MSN SIZO-00-293-0013).
2. SURFACES IN CONTACT WITH PLASTICS TO BE THOROUGHLY CLEANED AND FREE OF OIL OR GREASE.
3. THE FINISHED 15° SURFACE SHALL BE SMOOTH.
4. POLYESTER RESIN IN ACCORDANCE WITH MIL-R-21607 COMMERCIAL SOURCE - OWENS CORNING OR SIMILAR, CHOPPED FIBERGLASS - MIL-Y-1140 COMMERCIAL SOURCE - OWENS CORNING OR SIMILAR, FIRE RETARDANT POLYURETHANE - FOAM MIL-P-21929 SOURCE - GOLD BOND ZERO - O - CFL NATIONAL GYPSUM CO. OR SIMILAR.
5. THESE ENCLOSURES MAY BE USED ON STEEL OR ALUMINUM ALLOY STRUCTURES USING 1/8" STEEL OR 1/8" ALUMINUM TO SUIT.
6. THESE ENCLOSURES SHALL NOT BE INSTALLED UNTIL AFTER ALL CABLES HAVE BEEN INSTALLED AND COMPARTMENT'S CHECKED FOR TIGHTNESS.
7. THESE ENCLOSURES SHALL NOT BE INSTALLED ON THE WEATHER DECKS.
8. COLLAR HEIGHT SHALL BE 3" IN DRY AREAS BELOW DECKS.
9. COLLAR HEIGHT SHALL BE 9" IN WET DECK SPACES BELOW DECKS SUCH AS WASH-ROOMS AND SCULLERIES.
10. A GLASS REINFORCED PLASTIC COLLAR MAY BE USED IN LIEU OF METAL COLLAR.
11. SEE ALTERNATE METHOD FIGURE 4D2.
12. ALL WELDING SHALL BE IN ACCORDANCE WITH PARA. 5.7.3.6.
13. THIS FIGURE SUPERSEDES SHEET 4D1 OF DRAWING 803-5001027 AND SECTION 4, SHEET 15.6, OF DRAWING, NAVSEC NO. 8000-98702-73910.

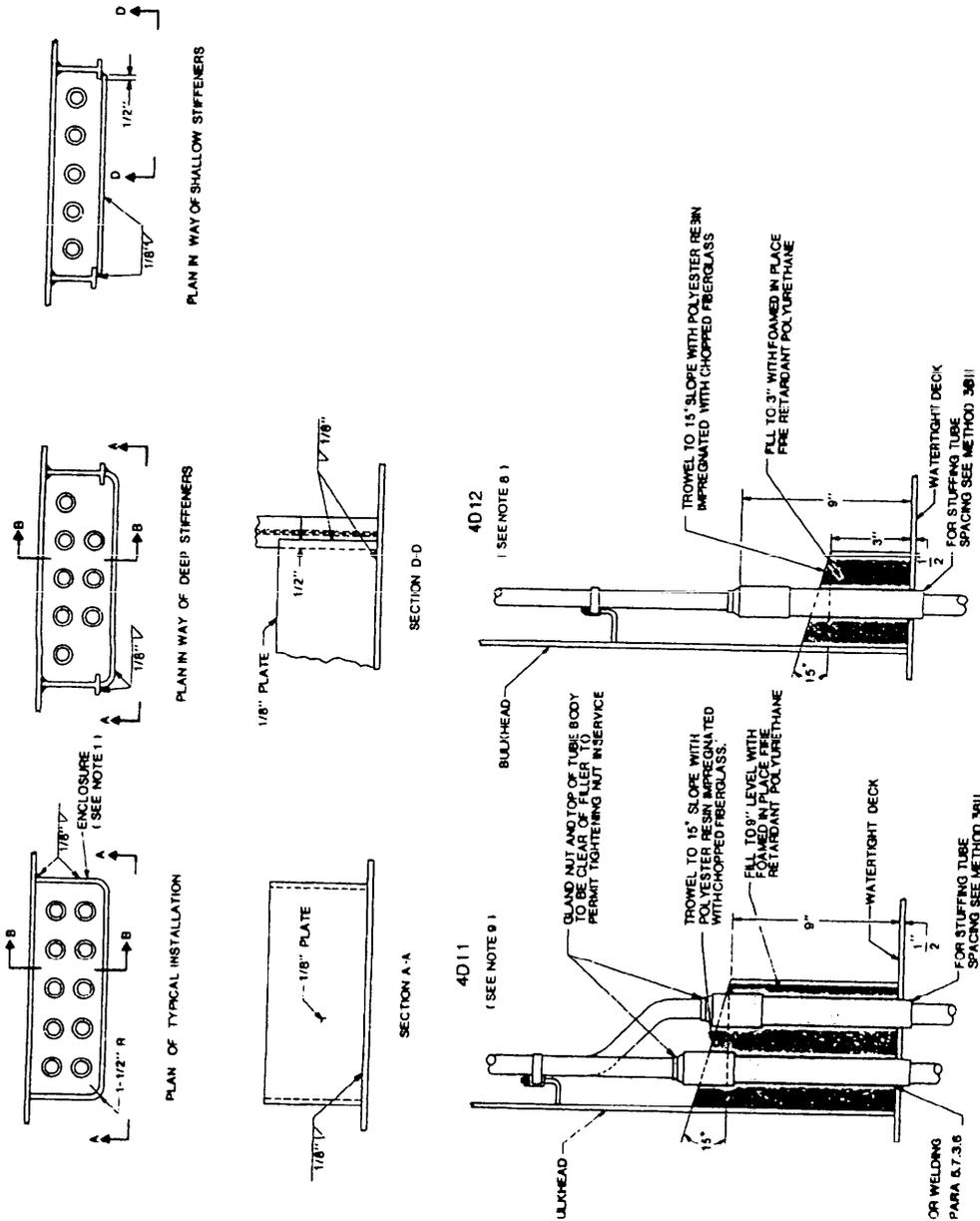


FIGURE 4D1. Protection of cables penetrating watertight decks.

SECTION B - B
SH 132317209

DOD-STD-2003-4(NAVY)
24 JUNE 1987

NOTE:
1. THIS FIGURE SUPERSEDES SHEET 4D2 OF DWG. 803-5001027 AND SECTION 4, SHEET 187, OF DRAWING NAVSEC NO. 9000-56202-73900.

METHOD 4D21
(ALTERNATE METHOD 4D11)

1. FOR STUFFING TUBE AREAS COERD THAN IN THE WEATHER A WITH THE TACK WELDS, APPLY RESIN ON THE DECK AROUND THE KICKPIRES SHALL BE ACCOMPLISHED AS FOLLOWS:
A. AFTER THE KICK-PIPE AND STUFFING TUBES HAVE BEEN INSTALLED AND THE CABLES PULLED IN, THE 16 GAGE STEEL COAMING SHALL BE FABRICATED TO SUIT AND TACK-WELDED WHERE DECK HAVE CURVED OR SHARP CORNERS. THE EPXY COMPOUND WILL BE LEVEL WITH THE TOP EDGE OF THE ENTIRE COAMING. THIS MAY NECESSITATE THE COAMING BE MADE AND TACK WELDED IN THREE SEPARATE PIECES IN LINE OF ONE CONTINUOUS FLAT BAR AS SHOWN IN PLAN VIEW THE HIGH SIDE OF THIS TUBE SHALL BE ROUNDED TO NOT EXCEED 1-1/2 INCHES.
B. THE DECK AROUND THE KICK-PIRES WITHIN THE COAMING ENCLOSURE AND THE DECK AROUND THE OUTSIDE OF THE COAMING SHALL BE THOROUGHLY CLEANED AS FOLLOWS (IT IS NOT NECESSARY TO REMOVE PAINT):
(1) BLOW OUT ALL DIRT AND LOOSE MATERIAL.
(2) WASH WITH FRESH WATER.
(3) RINSE WITH FRESH WATER.
(4) BLOW OUT EXCESS WATER.

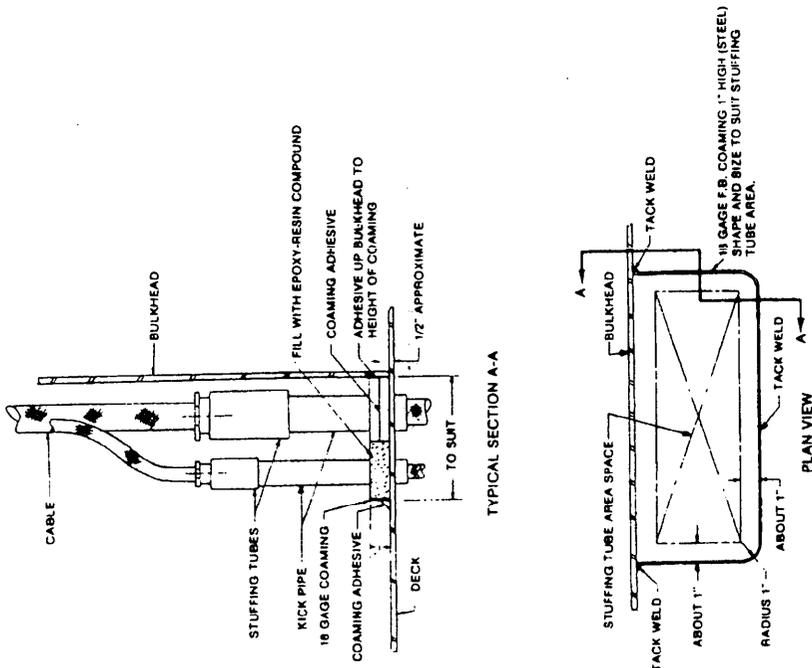
C. PUT A SMALL AMOUNT OF PHILADELPHIA RESIN CO. ADHESIVE RESIN (OR EQUIVALENT) INTO A SHALLOW CONTAINER OF PHILADELPHIA RESIN CO. ADHESIVE HARDENER (OR EQUIVALENT) MIX THOROUGHLY UNTIL THE MIXTURE IS UNIFORM IN COLOR. THE MIXTURE WILL PROVIDE ENOUGH ADHESIVE FOR ABOUT 3 LINEAL FEET OF COAMING.

D. APPLY THIS ADHESIVE "PUTTY" AROUND THE OUTSIDE OF THE COAMING WITH A ROUNDED END 3/4" WIDE SPATULA (OR EQUIVALENT) AND SHAPE IT TO A FILLET WITH THE END OF THE SPATULA. DIP THE SPATULA IN WATER TO PROVIDE A SLIGHTLY WET SURFACE. THE PHILADELPHIA RESIN CO. (OR EQUIVALENT) FIRST-UP HARDENER (BLACK LABELED CAN) INTO THE WHITE LABELLED CAN CONTAINING PRISOFR RESIN AND MIX THOROUGHLY FOR ABOUT 5 MINUTES UNTIL THE MIXTURE IS A UNIFORM LIGHT GRAY COLOR AND ANY SOLID MATERIAL IN THE BOTTOM OF THE CAN HAS DISPERSED. DO NOT THINK THE MIXTURE (MIXING CAN BE ACCOMPLISHED BY HAND OR WITH A SMALL ELECTRIC MIXER) IS COMPLETELY UNIFORM UNTIL 5 MINUTES AFTER THIS MIXTURE INTO THE KICK-PIPE AREA ENCLOSURE UNTIL IT BEGINS TO OVERFLOW THE COAMING PIPE EXCESS OFF OUTSIDE OF COAMING. ALLOW TO CURE HARD BEFORE PAINTING.

2. THE PRISOFR MATERIAL IS PACKAGED IN 6 LB. UNITS (1/2 GALLON SIZE) AND 12 LB. UNITS (1 GALLON SIZE). THE FOLLOWING IS A GUIDE FOR THE AMOUNT OF MATERIAL TO BE USED:
12 LB. UNIT WILL COVER APPROX. A 12" X 18" TUBE AREA
6 LB. UNIT CONSISTS OF 3 GAL. RESIN AND 1 PINT HARDENER
12 LB. UNIT CONSISTS OF 1 GAL. RESIN AND 1 QUART HARDENER

THE OV ADHESIVE MATERIAL IS PACKAGED IN 1/2 GALLON SIZE UNITS CONSISTING OF 1/2 QUART SIZE RESIN AND 1/4 QUART HARDENER.
3. CURE TIME IS 4 HOURS AT 80° F. 8 HOURS AT 75° F. AND 12 HOURS AT 60° F. USE HEAT LAMPS FOR TEMPERATURES BELOW 60° F. FOR CURING.

POT LIFE IS 45 MINUTES WHICH MEANS THAT THE EPXY-RESIN COMPOUND SHOULD BE USED WITHIN 45 MINUTES AFTER MIXING. SHELF LIFE OF THE MATERIAL BEFORE USE IS 1 YEAR.
LOCAL EXHAUST VENTILATION IS NOT NECESSARY WHEN USING THESE EPXY MATERIALS. HOWEVER, GOOD PERSONAL HYGIENE HABITS SHOULD BE USED AND CONTACT WITH THE SKIN SHOULD BE AVOIDED. AFTER USING THE EPXY MATERIAL WASH WITH BORAX SOAP OR WATERLESS SKIN CLEANER. SOLVENTS SHOULD BE AVOIDED AS A SKIN CLEANER BUT NECESSARY CLEANING SHOULD BE DONE WITH A SKIN CLEANER. EPOXY MATERIALS ARE PREFERRED IN NO CASE SHOULD PETROLEUM SOLVENTS OR CHLORINATED HYDROCARBONS SUCH AS GASOLINE, KEROSENE, BENZENE, DEGREASING SOLVENTS OR DRY CLEANING FLUIDS BE USED FOR CLEANING THE SKIN.



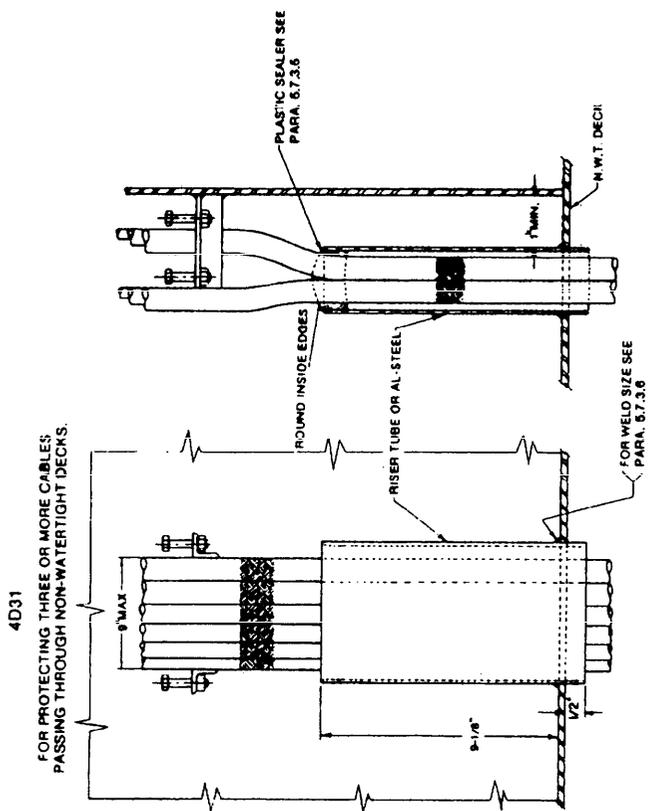
TYPICAL DECK STUFFING TUBE AREA

FIGURE 4D2. Protection of cables penetrating watertight decks.

SM 132317300

DOD-STD-2003-4(NAVY)
24 JUNE 1987

NOTES:
1. THIS FIGURE SUPERSEDES SHEET 4D3 OF DRAWING
803-500102/ AND SECTION 4, SHEET 37, OF DRAWING
NAVSEC NO. 9000-58202-73960.



SH 132317301

FIGURE 4D3. Protection of cables penetrating NTW deck.

DOD-STD-2003-4(NAVY)
24 JUNE 1987

- NOTES:
1. ALL WELDING SHALL BE IN ACCORDANCE WITH PARA. 5.7.3.6.
 2. THIS FIGURE SUPERSEDES SHEET 4D4 OF DRAWING 803-500 027 AND SECTION 2, SHEET 158, OF DRAWING NAVSEC NO. 0000-86202-73880.

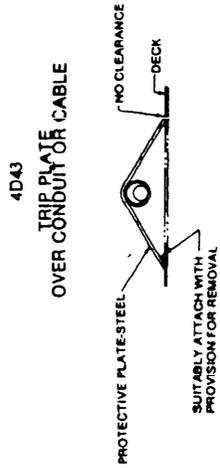
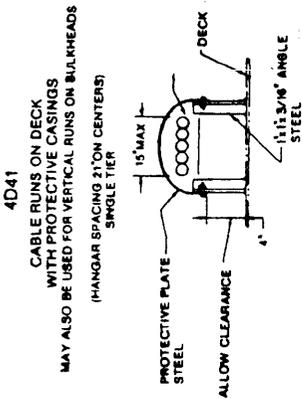
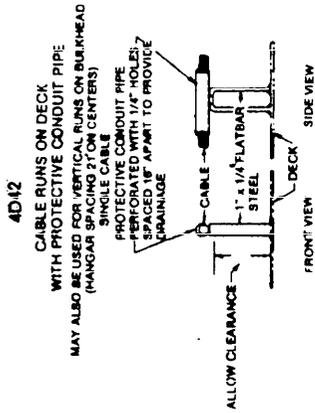


FIGURE 4D4. Protection of cables from mechanical injury.

SH 1323 17302

DOD-STD-2003-4(NAVY)
24 JUNE 1987

NOTES:
1. ALL WELDING SHALL BE IN ACCORDANCE WITH PARA. 5.7.3.8.
2. THIS FIGURE SUPERSEDES SHEET 4D5 OF DRAWING 803-5001027 AND SECTION 2, SHEET 157, OF DRAWING NAVSEC NO. 9000-S8102-73980.

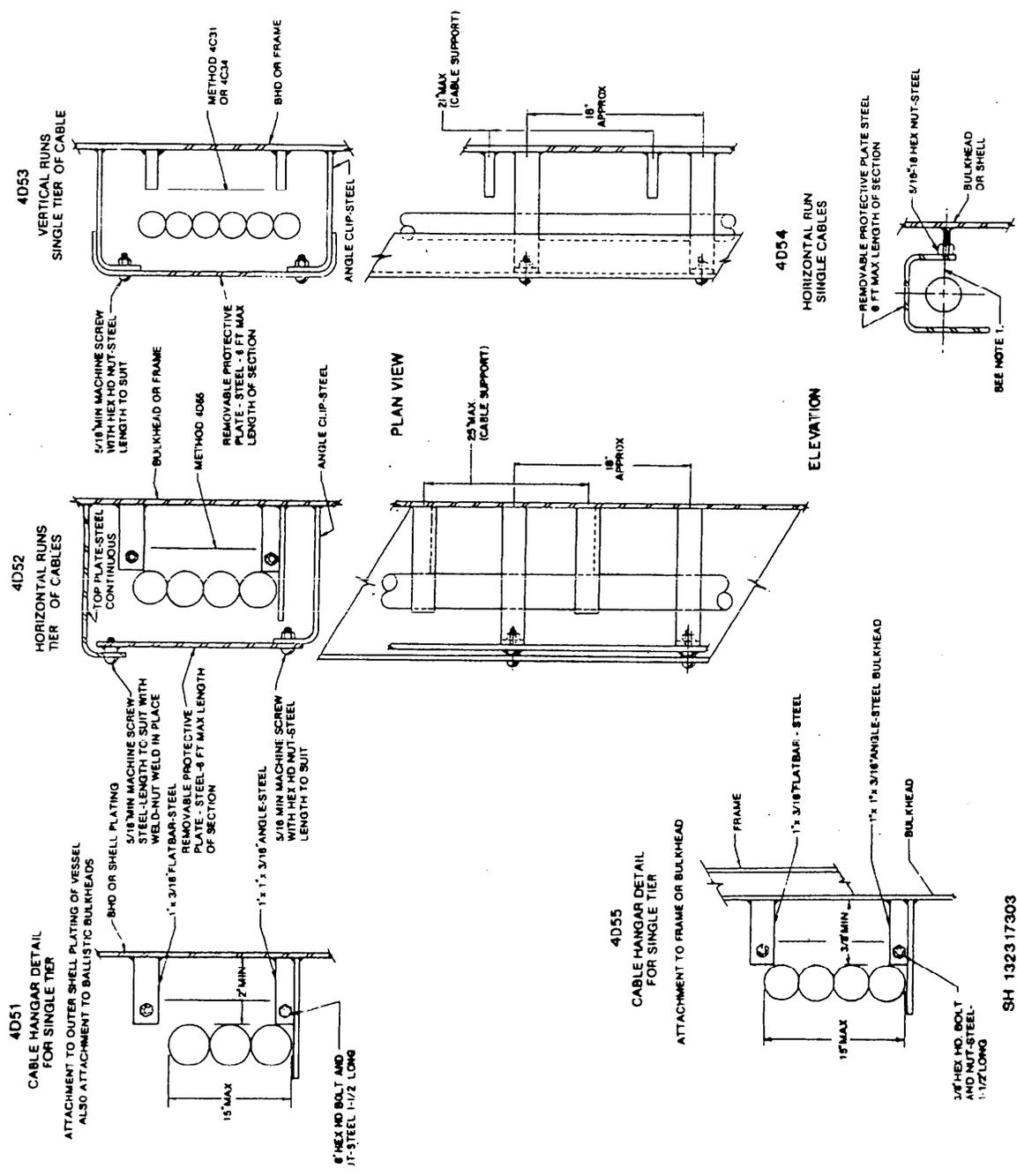


FIGURE 4D5. Protection of degaussing cables from mechanical injury.

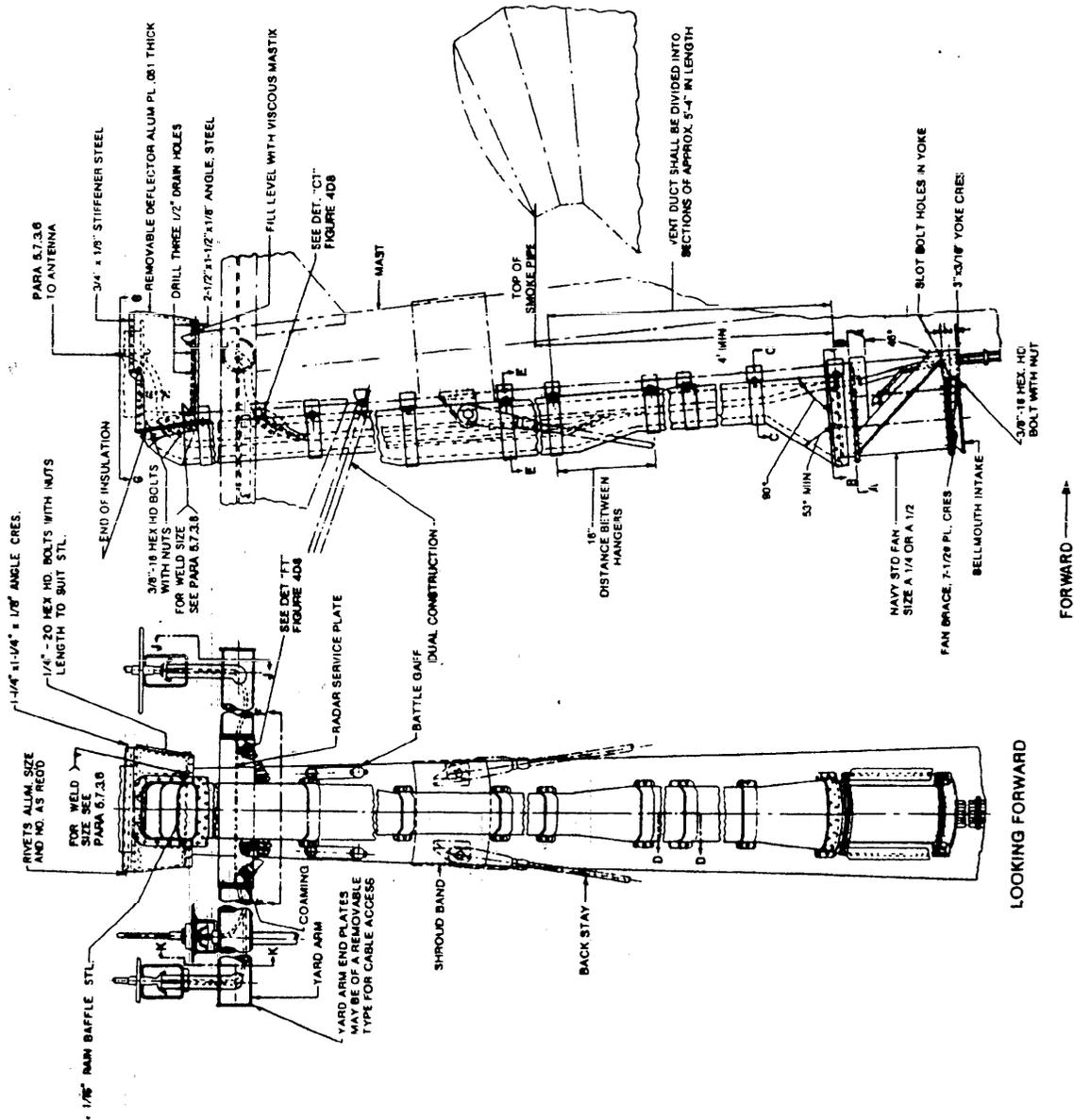
SH 132317303

DOD-STD-2003-4(NAVY)

24 JUNE 1987

NOTES:

1. THE AREA OF THE VENTILATION DUCT SHALL BE CALCULATED TO GIVE A MINIMUM FREE FLOW AREA OF 30 SQUARE INCHES FOR THE CLOSEST APPROACH OF DUCT TO THE MAST.
2. THE MINIMUM DISTANCE OF HANGER SUPPORT FROM THE INSULATION TO THE HANGER CHANNEL SHALL BE 1 1/2" TO REDUCE CONDUCTION ALONG HANGER.
3. ALL SEAMS, RIVETS AND OPENINGS IN DUCT WALL AND INSULATING MATERIAL SHALL BE MADE WEATHER TIGHT.
4. PROVIDE DOUBLER PLATES AS NECESSARY, WHERE ENTRANCE OF THE VENTILATION DUCT TO THE MAST IS MADE.
5. FAYING SURFACES OF STEEL AND ALUMINUM PARTS SHALL RECEIVE ONE COAT OF ZINC CHROMATE PRIMER.
6. AFTER INSTALLATION, ALL SURFACES OF DUCT SHALL RECEIVE NECESSARY COATS OF HEAT RESISTING PAINT TO MATCH THE SURROUNDING SURFACES.
7. IN DETERMINING THE SIZE OF DUCT FOR NEW CONSTRUCTION, ALLOWANCE SHALL BE MADE FOR SEVERAL COATS OF HEAT RESISTING PAINT TO ACCOMMODATE FUTURE RADAR AND ELECTRICAL REQUIREMENTS.
8. FOR VESSELS ON WHICH THE SCREENED SPEED LIGHT IS LOCATED ON THE MAINMAST, THE SERVICE CABLE SHALL BE BRANCHED FROM THE VENTILATION DUCT, THROUGH FLEXIBLE TUBING.
9. FREE FLOW AREAS WITHIN RAIN CAPS AND AIR FEEDING PIPE SHALL HAVE 1 1/2 TO 2 TIMES THE AREA OF THE FEEDING PIPE.
10. FLEXIBLE TUBING SHALL BE INSTALLED WITHOUT TWIST, SHALL HAVE SUFFICIENT SLACK TO PREVENT THE TUBING FROM BEING STRAINED UPON WORKING OF MAST AND YARD ARMS, AND WITH THE RUN PITCHED TO AVOID WATER POCKETS.
11. FLEXIBLE TUBING SHALL BE SUPPORTED AT 18" INTERVALS WHERE PRACTICABLE, OTHERWISE AT SUCH SPACING AND LOCATION THAT TUBING SHALL TAKE EASY BENDS, SUPPORTS SHALL NOT BE SO PLACED THAT THE FLEETING OF THE TUBING WILL BE RESTRAINED.
12. THIS FIGURE SUPERSEDES SHEET 4D6 OF DRAWING 803-500 1027 AND SECTION 2, SHEET 220, OF DRAWING NAVSEC NO. 9000-36202-739930



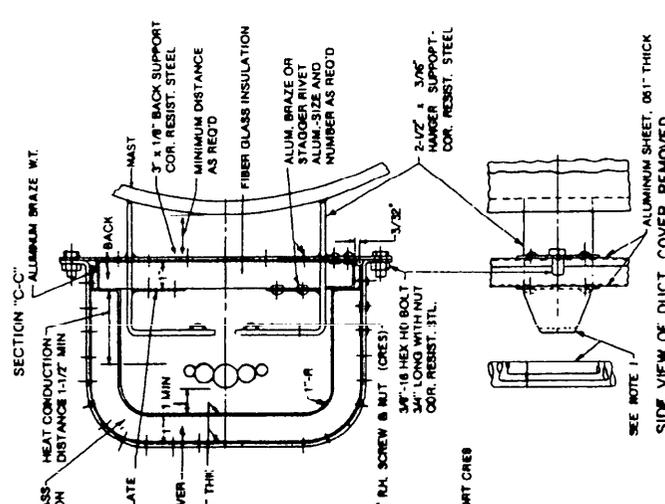
SH 132317304

LOOKING TO PORT

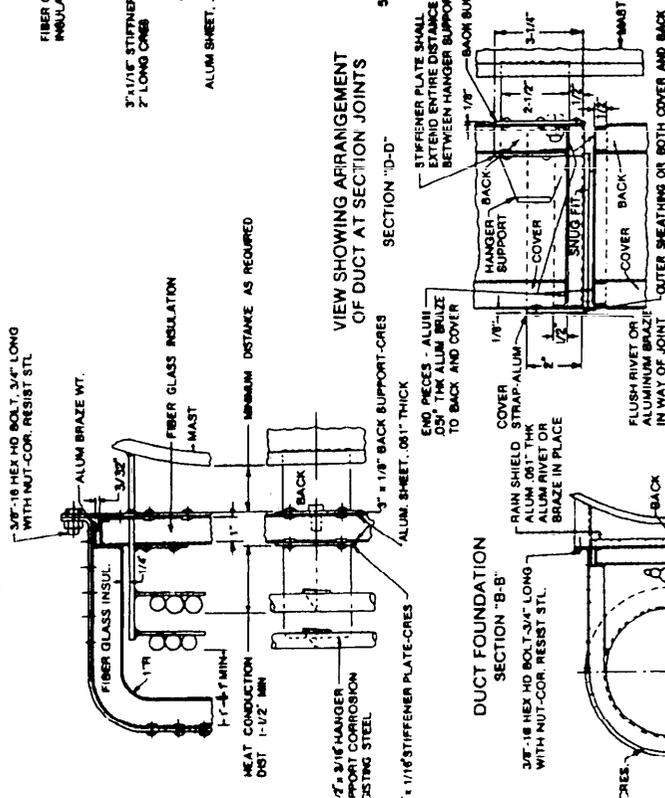
FIGURE 4D6. Protection of cables on mast (surface ships).

NOTES:
1 ALL WELDING REQUIRED TO FABRICATE SHALL BE IN ACCORDANCE WITH PARA. 5.7.3.A.
2 THIS FIGURE SUPERSEDES SHEET 4D7 OF DRAWING 803-5001027 AND SECTION 2, SHEET 221, OF DRAWING NAVSEC NO. 9000-58202-73960.

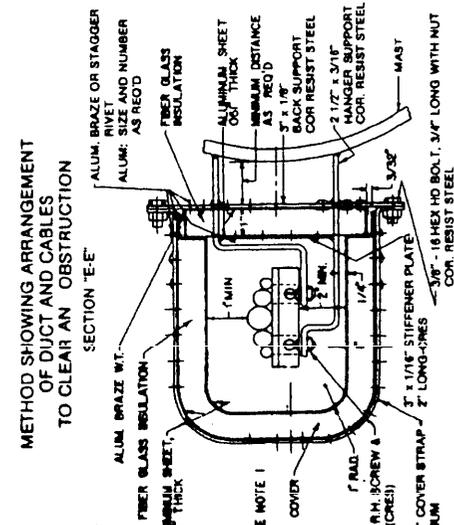
METHOD SHOWING ARRANGEMENT OF DUCT AND A SINGLE TIER OF CABLES ON MAST WITH ROOM FOR ADDITIONAL CABLES



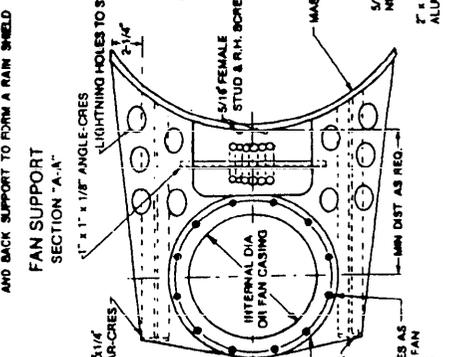
METHOD SHOWING ARRANGEMENT OF DUCT AND A DOUBLE TIER OF CABLES ON MAST



METHOD SHOWING ARRANGEMENT OF DUCT AND CABLES TO CLEAR AN OBSTRUCTION



FAN SUPPORT SECTION "A-A"



ELEVATION SECTIONS "A-A" & "B-B"

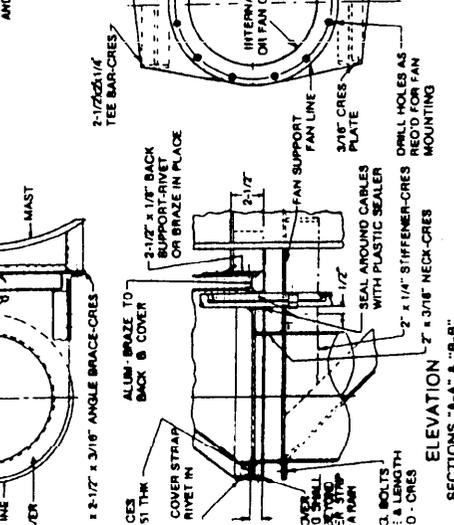


FIGURE 4D7. Protection of cables on masts (surface ships).

SH 132317305

DOD-STD-2003-4(NAVY)
24 JUNE 1987

NOTES:

1. THIS FIGURE SUPERSEDES SHEET 4D9 OF DRAWING 803-500 1027 AND SECTION 2, SHEET 140, OF DRAWING NAVSEC NO. 0000-96202-73980

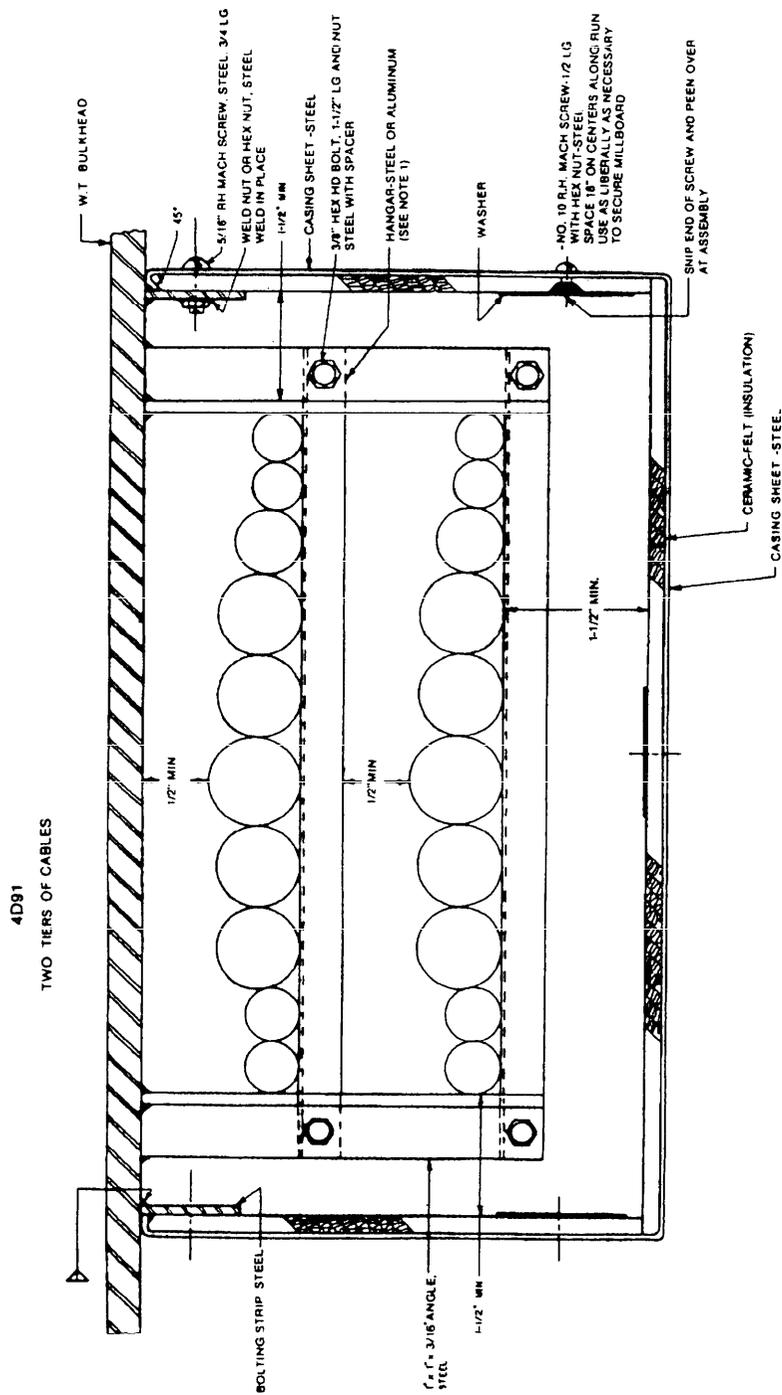


FIGURE 4D9. Protection of cables in hangar spaces (surface ships).

SH 132917307

DOD-STD-2003-4(NAVY)
24 JUNE 1987

- NOTES:
1. ALL WELDING SHALL BE IN ACCORDANCE WITH PARA. 5.7.3.6.
 2. THIS FIGURE SUPERSEDES SHEET 4D10 OF DRAWING 803-5001027 AND SECTION 2, SHEET 1432, OF DRAWING NAVSEC NO 8000-56202-73080.

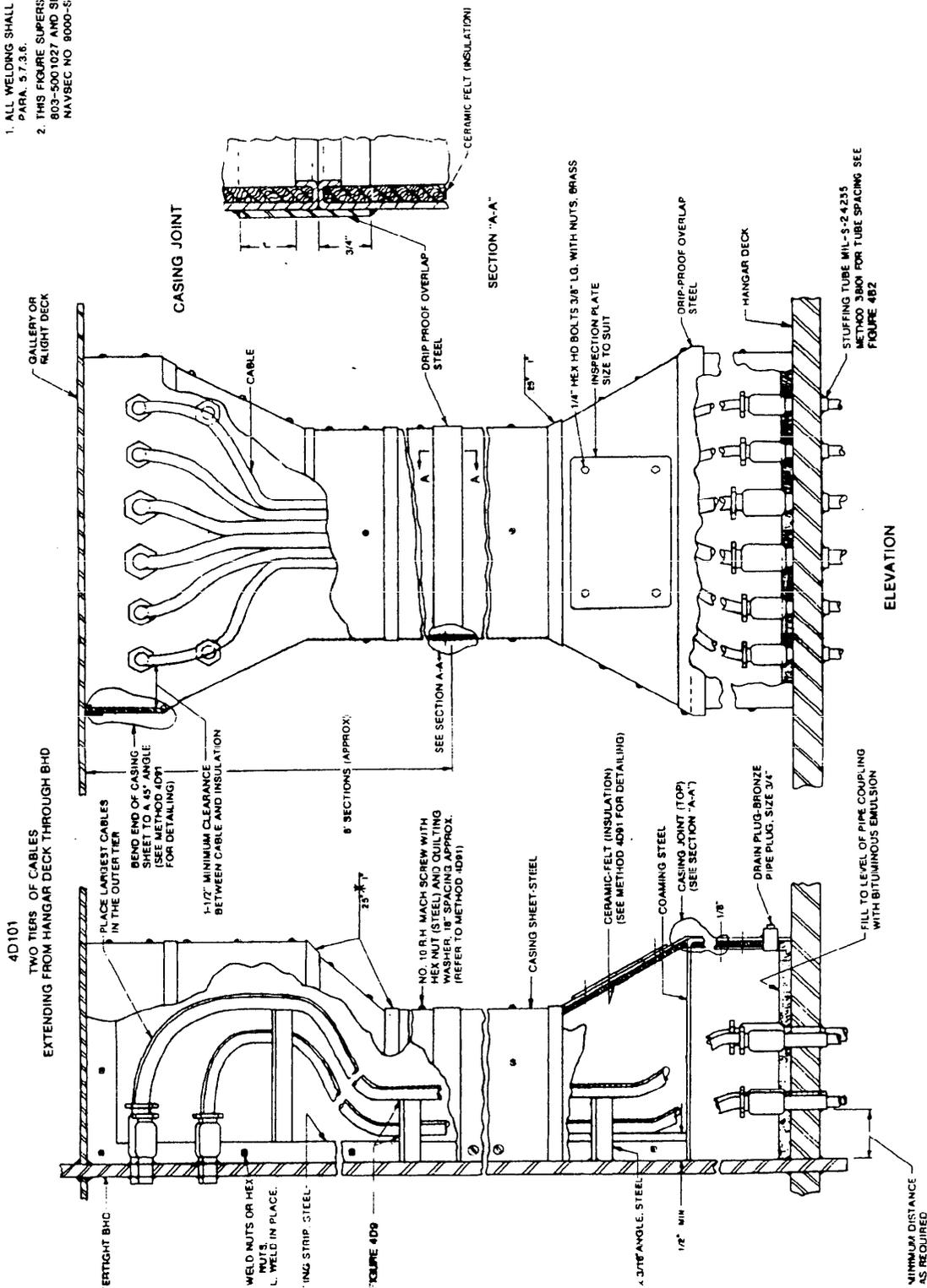


FIGURE 4D10. Protection of cables in hangar spaces (surface ships).

SH 132317308

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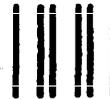
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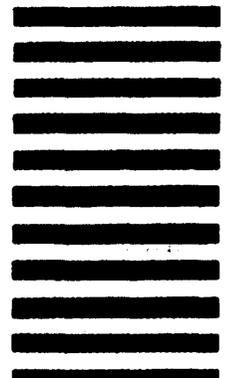
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