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MILITARY STANDARD

# FIBER OPTIC TOPOLOGY INSTALLATION STANDARD METHODS FOR NAVAL SHIPS (CABLE PENETRATIONS)

(PART 3 OF 6 PARTS)

AMSC N/A

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# FOREWORD

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

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 05Q42, 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.

3. This standard provides detailed information and guidance to personnel concerned with the installation of fiber optic topologies on Naval surface ships and submarines. The methods specified herein are not identifiable to any specific ship class or type, but are intended to standardize and minimize variations in installations to enhance the compatibility of the fiber optic topologies of all Naval ships.

4. In order to provide flexibility in the use and update of the installation methods, this standard is issued in seven parts; the basic standard and six numbered parts as follows:

Part 1 Cables
Part 2 Equipment
Part 3 Cable Penetrations
Part 4 Cableways
Part 5 Connectors and Interconnections
Part 6 Tests

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# 1. SCOPE

1.1 Scope. This standard provides detailed methods of fiber optic cable penetrations through ship structure and equipment via stuffing tubes, swage tubes, multiple cable penetrators, chafing collars and nipples.

1.1.1 Applicability. These criteria apply to installations on specific ships when invoked by the governing ship specification or other contractual document. They are intended primarily for new construction; however, they may also be used for the conversion or alteration of existing ships. The rapidly changing state of the art in fiber optic technology makes it essential that some degree of flexibility be exercised in enforcing this document. When there is a conflict between this document and the ship specification or contract, the ship specification or contract shall take precedence. Where ship design is such that the methods herein cannot be implemented, users shall submit new methods or modifications of existing methods to NAVSEA 06KR22 for approval prior to implementation.

## 2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

FEDERAL

| | |
|---|---|
| GGG-W-646 | - Wrench, Open End, Ratchet (TAC Pattern), for Tube Fittings, Electrical Cable Terminals and Stuffing Tube Gland Nuts. |

MILITARY

| | |
|---|---|
| MIL-I-3064 | - Insulation, Electrical, Plastic-Sealer. |
| MIL-R-15624 | - Rubber Gasket Material, 50 Durometer Hardness (Maximum). |
| MIL-P-16685 | - Packing, Material and Packing Preformed (Stuffing Tube for Electrical Cables). |
| MIL-S-24235 | - Stuffing Tubes, Metal and Packing Assemblies for Electric Cables, General Specification for. |
| MIL-S-24235/1 | - Stuffing Tube, Metal, and Packing Assemblies for Electric Cables, Bulkhead, Pressureproof. |
| MIL-S-24235/9 | - Stuffing Tubes, Metal and Packing Assemblies for Electric Cables, Brass and Steel, for Decks and Bulkheads with Pipe Protection. |

MIL-S-24235/10 - Stuffing Tubes, Metal and Packing Assemblies for Electric Cables, Steel, for Decks and Bulkheads without Pipe Protection.

MIL-S-24235/17 - Stuffing Tube, Metal, and Packing Assemblies for Electric Cables, Swage Type, Steel and Aluminum, for Deck and Bulkheads with Pipe Protection.

MIL-S-24235/18 - Stuffing Tube, Metal, and Packing Assemblies for Electric Cables, Swage Type, Reduced Diameter, Steel and Aluminum, for Deck and Bulkheads with Pipe Protection.

MIL-P-24705 - Penetrators, Multiple Cable, for Electric Cables, General Specification for.

STANDARDS

MILITARY

DOD-STD-2003 - Electric Plant Installation Standard Methods for Surface Ships and Submarines.

DOD-STD-2003-3 - Electric Plant Installation Standard Methods for Surface Ships and Submarines (Penetrations).

DOD-STD-2196 - Glossary, Fiber Optics

MIL-STD-2042-2 - Fiber Optic Topology Installation Standard Methods for Naval Ships (Equipment).

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

2.1.2 Other Government documents. The following other Government documents form a part of this standard to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

DOCUMENTS

| | |
|---|---|
| DDS 100-1 | - Reinforcement of Openings in Structure of Surface Ships Other than in Protective Plating. |
| DDS 100-2 | - Openings in Decks and Bulkheads for Stuffing Tubes and Pipe. |

(Copies of documents 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. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

## 3. DEFINITIONS

3.1 General fiber optics terms. Definitions for general fiber optics terms used in this standard are in accordance with DOD-STD-2196. Definitions for other terms as they are used in this standard are given in the following paragraphs.

3.2 Metal stuffing tube. A metal stuffing tube provides a means for making watertight single cable penetrations through shell plating, decks, and bulkheads, and into equipment.

3.3 Swage tube. A swage tube provides watertight cable penetrations through decks and is an alternative to a stuffing tube with a kickpipe.

3.4 Multiple cable penetrator (MCP). A MCP provides a means for making watertight, airtight, and firetight penetrations through decks, bulkheads, and into equipment.

3.5 Chafing collar. A chafing collar is a round or oval banding that protects two or more cables that penetrate structure from crimping and wear caused by rubbing against sharp edges.

3.6 Nipple. A nipple is a smaller version of the chafing collar, and is used to protect a single cable penetration.

3.7 Collective protection system (CPS). A CPS system is a system designed to inhibit the entry of chemical, biological, and radiological contaminants into collective protection zones on board Naval ships.

3.8 Kickpipe. A kickpipe is a pipe welded into the deck with a stuffing tube attached. Kickpipes provide protection for cables at deck penetrations and are used to clear an obstruction or preserve alignment.

## 4. GENERAL REQUIREMENTS

4.1 Cable penetrations. Fiber optic cable penetrations of ship structure shall be made by metal stuffing tubes (see 3.2), swage tubes (see 3.3), multiple cable penetrators (see 3.4), chafing collars (see 3.5), or nipples (see 3.6). Cable penetrations into equipment shall be made by nylon stuffing tubes or integral multiple cable penetrators in accordance with Part 2 of this standard. Penetrations of ship structure shall be in accordance with this Part of this standard.

4.1.1 Cable penetration of ship structure. Cable penetration of ship structure shall be in accordance with DDS 100-1, DDS 100-2, the methods described herein, and as follows:

a. Metal stuffing tubes or multiple cable penetrators (MCP's) shall be used for the penetration of the following structures, except that only metal stuffing tubes shall be used to penetrate bulkheads or decks that are exposed to the weather:

(1) Collective protection system (CPS) (see 3.7) boundaries.

(2) Watertight cable trunks.

(3) Watertight decks.

(4) Watertight bulkheads.

(5) Bulkheads designed to withstand a waterhead.

(6) That portion of a bulkhead specified to be watertight to a certain height.

(7) That portion of a bulkhead below the height of the sill or the coaming of a compartment access.

(8) Bulkheads surrounding compartments subject to flooding by sprinkling systems.

(9) Garbage disposal rooms.

(10) Battery shops.

(11) Medical operating rooms.

(12) Medical wards.

b. Metal stuffing tubes only shall be used to penetrate decks and bulkheads forming the boundaries of spaces containing volatile, combustible, or explosive material.

c. Unless otherwise specified, metal stuffing tubes, multiple cable penetrators or nipples and chafing collars packed with plastic sealer shall be used for the following penetrations. The method selected shall satisfy the tightness requirements of the structure.

(1) Decks (non-watertight).

(2) Structural bulkheads.

(3) Airtight bulkheads.

(4) Fumetight bulkheads.

(5) Multiple cable (two or more) penetrations through non-structural steel bulkheads (other than mesh or expanded metal), bents, web frames, transverse girders and longitudinal girders.

Cable penetrations of vertical non-tight structures within a compartment need not be sealed at intervals closer than 20 feet horizontally. However, if one penetration on the structure requires sealing, then all penetrations of that structure shall be sealed.

d. Metal stuffing tubes in accordance with MIL-S-24235/1 shall be used to penetrate pressureproof submarine bulkheads and surface ship sonar domes that are filled with water under normal operating conditions. One half of the tube may be used to penetrate surface ship sonar dome only.

e. The size of the stuffing tube groups shall be limited to permit tightening of gland nuts in the group using stuffing tube wrench set type II, class I, style A, form B in table IV of GGG-W-646. Penetration spacing shall be as specified in DDS 100-2.

4.1.2 Plastic sealer. Plastic sealer, type HF as specified in MIL-I-3064 shall be used to seal the space around the cables in collars or nipples used for passing cables through light tight and fume tight bulkheads.

4.1.3 Kickpipes. Kickpipes (see 3.8) shall be made of a material to suit the structure being penetrated and shall be compatible with the stuffing tube material. Pipe ends shall be chamfered and inside wall burrs shall be removed to prevent chafing of the cable jacket. Swage tubes in accordance with MIL-S-24235/17 or MIL-S-24235/18 may be used as an alternative to stuffing tubes in accordance with MIL-S-24235/9.

4.1.4 Multiple cable penetrators (MCP's). MCP's shall be in accordance with MIL-P-24705.

4.1.5 Metal stuffing tubes. Metal stuffing tubes shall be in accordance with MIL-S-24235.

4.1.5.1 Stuffing tube packing. Packing for stuffing tubes that penetrate submarine pressureproof and surface ship ballistic bulkheads, and sonar domes filled with water under normal operating conditions shall be in accordance with MIL-S-24235/1. For all other metal stuffing tubes, packing shall be in accordance with either the preformed (coil), class 2 or the bulk, class 1 of MIL-P-16685. When bulk packing is used, the first and last turns shall be part A (hard) and the intermediate turns shall be part B (soft). Reinforced neoprene packing in accordance with class 1 of MIL-R-15624 may be used as an alternate.

4.1.6 Chafing collars and nipples. Collar length shall be not less than 3 inches (76 mm) with a minimum radial distance between the cable and collar of 1 inch (25 mm). Nipple length shall be not less than 2 inches (51 mm), with a minimum radial distance between the cable and the nipple of 0.25 inch (6 mm).

4.2 Safety precautions. The following safety precautions apply:

a. The classification of a laser is based on the ability of the optical beam to cause damage to the eye. Under normal operating conditions, an optical fiber communication system (OFCS) is inherently an eye safe system; but, when an optical fiber connection is broken and optical viewing instruments are used, it is possible that hazardous energy can enter the eye. For this reason four service group hazard classes have been devised to indicate the degree of hazard and required hazard control

measures. Refer to ANSI Z136.2 for a full technical definition. The following laser safety precautions shall apply:

(1) Ensure personnel are familiar with the laser degree of hazard and the required control measures.

(2) Light generated by light emitting diodes (LED's) and laser diodes may not be visible but is still hazardous to the unprotected eye. Never look into the end of an optical fiber connected to an LED or laser diode and do not examine or stare into broken, severed or disconnected optical cables.

(3) When access panels or doors are removed or opened and the critical viewing distance could exceed 39 inches (100 cm), use means to contain the beam to preclude exposure of nearby personnel.

(4) Do not view the primary beam or a specular reflection from an OFCS with an optical microscope, eye loupe or other viewing instrument. The instrument may create a hazard due to its light gathering capability.

b. Safety glasses shall be worn when handling bare fibers. Always handle cable carefully to avoid personal injury. The ends of optical fibers are extremely sharp and can lacerate or penetrate the skin or cause permanent eye damage if touched. If the fiber penetrates the skin, it most likely will break off, in which case the extraction of the fiber should be performed by trained medical personnel to prevent further complications.

c. Wash hands after handling bare fibers.

## 5. DETAILED REQUIREMENTS

5.1 Penetration of ship structure (submarines). Fiber optic cables shall penetrate ship structure of submarines in accordance with Figures 3A1 and 3A10 through 3A23 of DOD-STD-2003-3, as modified (see 5.5). Stuffing tube sizes for fiber optic cables shall be selected in accordance with Method 3A1-1 of this standard.

5.2 Penetration of ship structure (surface ships) using steel or aluminum stuffing tubes. Fiber optic cables shall penetrate ship structure of surface ships using steel or aluminum stuffing tubes in accordance with Figures 3B1 through 3B3, 3B10 through 3B24, 3B43 through 3B46, 3B48 and 3B49, 3C13 through 3C16 and 3C18 of DOD-STD-2003-3, as modified (see 5.5). Stuffing tube sizes for fiber optic cables shall be selected in accordance with Method 3A1-2 of this standard.

5.3 Penetration of ship structure using multiple cable penetrators (MCP's). Fiber optic cables shall penetrate ship structure using MCP's in accordance with Figures 3B25, 3B27 through 3B35, and 3B54 through 3B66 of DOD-STD-2003-3, as modified (see 5.5). MCP insert block sizes for fiber optic cables shall be selected in accordance with Method 3B1 of this standard.

5.4 Penetration of ship structure using kickpipes. Fiber optic cables shall penetrate ship structure using kickpipes in accordance with Figures 3D1 through 3D6 and 3D8 of DOD-STD-2003-3, as modified (see 5.5). Stuffing tube sizes for fiber optic cable shall be in accordance with Method 3A1-2 of this standard. Swage tubes may be used in place of kickpipes. Swage tube sizes for fiber optic cable shall be selected in accordance with Method 3A1-3 of this standard.

5.5 Retention of the watertight seal. The fiber optic cable may lose some of its resiliency after being compressed. To ensure the watertight seal is achieved and maintained, retighten cap (stuffing tube) or bolt (MCP) approximately 24 hours after initial compression.

## 6. NOTES

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

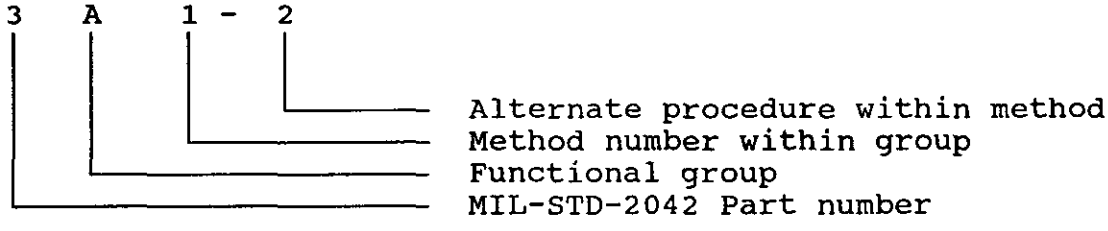
6.1 Intended use. The methods for cable penetrations depicted in this standard are intended primarily for new construction; however, they may be used for conversion or alteration of existing ships.

6.2 Issue of DODISS. When this standard is used in acquisition, the applicable issue of DODISS must be cited in the solicitation (see 2.1.1).

6.3 Standard method designation. To simplify the usage of this standard, an alpha-numeric designation system was developed to identify and locate a given method. The methods were grouped together by function as follows:

| | |
|---|---|
| Group A: | Cable penetrations via metal stuffing tubes |
| Group B: | Cable penetrations via MCP |

Then the designation system was completed as follows:




Thus, method 3A1-2 identifies the second alternate procedure for method 1 of group A in Part 3 (MIL-STD-2042-3) of MIL-STD-2042.

6.4 Subject term (key word) listing.

Cable penetrations of ship structure
Metal stuffing tubes
Swage tubes
Kickpipes
Chafing collar
Nipple
Multiple cable penetrator (MCP)
Fiber optic topology
Collective protection system (CPS)

Preparing activity:
NAVY - SH
(Project GDRQ-N130)

## METHOD 3A1

## CABLE PENETRATIONS VIA METAL STUFFING TUBES

1.1 Scope. These methods identify stuffing tube sizes used to pass fiber optic cables through decks and bulkheads. The methods for installation of the stuffing tubes is the same as those specified for electrical cables in DOD-STD-2003. These installation methods are not repeated in this standard but they are identified in paragraph 5 in this part of this standard.

2. REQUIRED EQUIPMENT AND MATERIALS. (Not applicable.)

3. PROCEDURES.

3.1 Safety summary. The following safety precautions shall be observed during the passing of fiber optic cables through the installed stuffing tubes:

a. Safety glasses shall be worn when handling bare fibers.

b. Do not touch ends of fibers as they are razor sharp. Wash hands after handling fiber.

c. Observe warnings and cautions on equipment and materials.

d. Never look into the end of a fiber connected to a laser source or LED.

3.2 Procedure I. Method 3A1-1-Metal stuffing tubes for submarines.

Step 1 - Select steel stuffing tubes from those shown in tables 3A1-I and 3A1-II.

TABLE 3A1-I. Steel stuffing tube sizes for fiber optic cable (Submarines).

| Cable type | Cable O.D. inches (mm) (nominal) | Tube size | Packing assembly | |
|---|---|---|---|---|
| | | | Part no. M24235/2 | Symbol no. |
| 2-Fiber | 0.28 (7) | 1 | -001 | 2405.1 |
| 4-Fiber | 0.31 (8) | 1 | -002 | 2405.2 |
| 8-Fiber | 0.43 (11) | 1 | -003 | 2405.3 |

TABLE 3A1-II. Steel stuffing tube data (Submarines).

| Grade steel | | HY-80 | HT |
|---|---|---|---|
| Stuffing tube assembly | Part number M24235/1 | -001 | -101 |
| | NSN 5975-00-881 | -8252 | -8251 |
| Part numbers of components | Tube body (1 required) M24235/1 | -010 | -110 |
| | Gland nut (2 required) M24235/1 | -019 | -119 |
| | Lock washer (2 required) M24235/1 | -028 | -128 |
| Symbol number | | 2405 HY-80 | 2405-HT |

3.3 Procedure II. Method 3A1-2- Metal stuffing tubes for surface ships.

Step 1 - Select steel or aluminum stuffing tubes from those shown in tables 3A1-III and 3A1-IV.

TABLE 3A1-III. Aluminum and steel stuffing tube sizes for fiber optic cable (Surface ships).

| Cable type | Cable O.D. inches (mm) (nominal) | Tube size MIL-S-24235 /9 and /10 | Packing assembly MIL-P-16685 |
|---|---|---|---|
| 2-Fiber | 0.28 (7) | A | Class 1 and 2 |
| 4-Fiber | 0.31 (8) | A | Class 1 and 2 |
| 8-Fiber | 0.43 (11) | B | Class 1 and 2 |

TABLE 3A1-IV. Steel stuffing tube data for decks and bulkheads with and without pipe protection.

| Tube type | | Without pipe protection | | With pipe protection | |
|---|---|---|---|---|---|
| Tube size | | A | B | A | B |
| Stuffing tube assembly | Part number M24235/ | 10-01 | 10-02 | 09-121 | 09-122 |
| | NSN 5975-00-178 | -0751 | -0752 | -1514 | -1515 |
| Part numbers of components | Tube body (1 required) M24235/ | 10-31 | 10-32 | 09-151 | 09-152 |
| | Gland nut (1 required) M24235/ | 09-001 | 09-002 | 09-061 | 09-062 |
| | Gland ring (1 required) M24235/ | 09-091 | 09-092 | 09-181 | 09-182 |
| Symbol number | | 1600 | 1601 | 1570 | 1571 |

3.4 Procedure III. Swage type stuffing tubes.

Step 1 - Select swage type aluminum or steel stuffing tubes from those shown in tables 3A1-V, 3A1-VI, 3A1-VII or 3A1-VIII respectively.

TABLE 3A1-V. Swage type aluminum stuffing tube data for decks and bulkheads.

| Tube type | | Bulkheads | | Decks | |
|---|---|---|---|---|---|
| Tube size | | A | B | A | B |
| Stuffing tube assembly | Part number M24235/17 | -031 | -032 | -091 | -092 |
| | NSN 5975-01-014 | -9958 | -9959 | -9976 | -9977 |
| Part numbers of components | Tube body (1 required) M24235/17 | -151 | -152 | -211 | -212 |
| | Gland nut (1 required) M24235/17 | -241 | -242 | -241 | -242 |
| | Gland ring (1 required) M24235/17 | -271 | -272 | -271 | -272 |
| Symbol number | | 1731 | 1732 | 1791 | 1792 |

TABLE 3A1-VI. Swage type steel stuffing tube data for decks and bulkheads.

| Tube type | | Bulkheads | | Decks | |
|---|---|---|---|---|---|
| Tube size | | A | B | A | B |
| Stuffing tube assembly | Part number M24235/17 | -001 | -002 | -061 | -062 |
| | NSN 5975-01-014 | -8994 | -8995 | -9005 | -9935 |
| Part numbers of components | Tube body (1 required) M24235/17 | -121 | -122 | -181 | -182 |
| | Gland nut (1 required) M24235/09 | -061 | -062 | -061 | -062 |
| | Gland ring (1 required) M24235/09 | -181 | -182 | -181 | -182 |
| Symbol number | | 1701 | 1702 | 1761 | 1762 |

TABLE 3A1-VII. Reduced diameter swage type aluminum stuffing tube data for decks and bulkheads.

| Tube type | | Bulkheads | | Decks | |
|---|---|---|---|---|---|
| Tube size | | A | B | A | B |
| Stuffing tube assembly | Part number M24235/18 | -031 | -032 | -091 | -092 |
| Part numbers of components | Tube body (1 required) M24235/18 | -151 | -152 | -211 | -212 |
| | Gland nut (1 required) M24235/17 | -241 | -242 | -241 | -242 |
| | Gland ring (1 required) M24235/17 | -271 | -272 | -271 | -272 |
| Symbol number | | 1843 | 1844 | 1941 | 1942 |

TABLE 3A1-VIII. Reduced diameter swage type steel stuffing tube data for decks and bulkheads.

| Tube type | | Bulkheads | | Decks | |
|---|---|---|---|---|---|
| Tube size | | A | B | A | B |
| Stuffing tube assembly | Part number M24235/18 | -001 | -002 | -061 | -062 |
| Part numbers of components | Tube body (1 required) M24235/18 | -121 | -122 | -181 | -182 |
| | Gland nut (1 required) M24235/09 | -061 | -062 | -061 | -062 |
| | Gland ring (1 required) M24235/09 | -181 | -182 | -181 | -182 |
| Symbol number | | 1821 | 1822 | 1911 | 1912 |

# METHOD 3B1

# CABLE PENETRATIONS VIA MCP'S

## 1. SCOPE.

1.1 Scope. This method identifies MCP insert block sizes used to pass fiber optic cables through decks and bulkheads. The methods for installation of the MCP and insert blocks is the same as those specified for electrical cables in DOD-STD-2003-3. These installation methods are not repeated in this standard but they are identified in paragraph 5 in this part of this standard.

## 2. REQUIRED EQUIPMENT AND MATERIALS. (Not applicable.)

## 3. PROCEDURES.

3.1 Safety summary. The following safety precautions shall be observed during the passing of fiber optic cables through the installed MCP's.

a. Safety glasses shall be worn when handling bare fibers.

b. Do not touch ends of fibers as they are razor sharp. Wash hands after handling fiber.

c. Observe warnings and cautions on equipment and materials.

d. Never look into the end of a fiber connected to a laser source or LED.

3.2 Procedure.

Step 1 - Select MCP insert blocks from those shown in table 3B1-I.

TABLE 3B1-I. MCP data and insert block sizes for fiber optic cable.

| Cable type | 2-Fiber | 4-Fiber | 8-Fiber |
|---|---|---|---|
| Cable O.D. inches (mm) (nominal) | 0.28 (7) | 0.31 (8) | 0.43 (11) |
| Primary insert block part number M24705/1-BN | 1507 | 1508 | 2011 |
| Primary insert block NSN 5975-01-033- | 9613 | 9614 | 9617 |
| Alternate insert block part number M24705/1-BN | 2007 | 2008 | N/A |
| Alternate insert block NSN 5975-01-034- | 5540 | 5541 | N/A |

# STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

## INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
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| I RECOMMEND A CHANGE: | 1. DOCUMENT NUMBER | 2. DOCUMENT DATE (YYMMDD) |
|---|---|---|
| | MIL-STD-2042-3(SH) | 930707 |

**3. DOCUMENT TITLE**
FIBER OPTIC TOPOLOGY INSTALLATION STANDARD METHOD FOR NAVAL SHIPS

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

**5. REASON FOR RECOMMENDATION**

**6. SUBMITTER**

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

**8. PREPARING ACTIVITY**

| a. NAME TECHNICAL POINT OF CONTACT:<br>Mr. Charles Courchaine | b. TELEPHONE (Include Area Code)<br>(1) Commercial: 703-602-3221<br>(2) AUTOVON: 332-3221 |
|---|---|
| c. ADDRESS (Include Zip Code)<br>Commander, SEA 03Q42<br>Naval Sea Systems Command<br>2531 Jefferson Davis Hwy<br>Arlington, VA 22242-5160 | IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:<br>Defense Quality and Standardization Office<br>5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466<br>Telephone (703) 756-2340 AUTOVON 289-2340 |