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MILITARY STANDARD

FIBER OPTIC TOPOLOGY INSTALLATION STANDARD METHODS FOR NAVAL SHIPS (CABLEWAYS)

(PART 4 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 for installing fiber optic topology (see 3.2) cableways and cable protection on surface ships and submarines.

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 Standards. The following 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).

STANDARDS

MILITARY

DOD-STD-2003-4 - Electric Plant Installation Standard Methods for Surface Ships and Submarines (Cableways).

DOD-STD-2196 - Glossary, Fiber Optics.

MIL-STD-2042-1 - Fiber Optic Topology Installation Standard Methods for Naval Ships (Cables).

MIL-STD-2042-3 - Fiber Optic Topology Installation Standard Methods for Naval Ships (Cable Penetrations).

MIL-STD-2042-6 - Fiber Optic Topology Installation Standard Methods for Naval Ships (Tests).

(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.

NAVSEA Drawing - 803-5184182 Passive Fire Protection Insulation - Installation Details.

- 302-2146949 Electronics/Electrical Installation Methods.

- 302-4456087 Electronics/Electrical Installation Methods.

(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 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 Fiber optic topology. The fiber optic topology consists of fiber optic interconnection boxes, trunk and local cables and the connectors and splices used to interconnect the trunk and local cables.

3.3 Installing activity. An installing activity is any military, commercial, or industrial organization involved with the installation of fiber optic topologies aboard Naval ships.

3.4 Trunk cable. A trunk cable is a fiber optic cable that provides a continuous optical path between interconnection boxes. Typically, trunk cables are run in the main cableways and have higher fiber counts per cable than local cables.

3.5 Primary channel. A primary (normal) channel is an allocated and used active link between system equipment that has a designated active backup link.

3.6 Non-redundant channel (NRC). A non-redundant channel is any allocated and used active link that has no system required backup link, but is provided with redundant trunk fibers by the topology.

3.7 Alternate channel. An alternate channel is the allocated and used backup link for a primary channel.

3.8 Local cable. A local cable is a fiber optic cable that provides a continuous optical path between an end user equipment and an interconnection box, and is typically not run through the main cableways.

3.9 End user equipment. End user equipment refers to any cabinet, case, panel, or device that contains components that are either the origin or destination of an optical signal.

3.10 Minimum bend radius. The minimum bend radius of a fiber optic cable is the radius at which the cable can be bent without degrading optical performance. The dynamic bend applies during handling and installing; the static bend applies to the completed installation.

3.11 Authorized approval. Authorized approval is written approval from the cognizant Government activity.

4. GENERAL REQUIREMENTS

4.1 Location of fiber optic cable runs. Fiber optic cable shall be located so as to avoid physical interference with electric cables and equipment and to minimize risk of battle damage. Cable runs shall be located so that fiber optic cables will not be disturbed by disassembly or removal of machinery, including the removal of bolted or welded equipment removal plates. Fiber optic cables may be run in cableways with electric power and signal cables. However, fiber optic cables should not be installed in cableways with armored cables unless no feasible alternative routing exists. If fiber optic cables must be installed in the same cableways as armored cables, additional precautions must be taken during installation to prevent mechanical damage (see 4.2). Fiber optic cable shall not be run through bilge areas unless such routing is necessary to provide survivability through redundant signal paths. In such cases, suitable cable protection shall be provided (see 4.1.7). Where the installing activity (see 3.3) is responsible for the design of the fiber optic topology cableways, it shall be as specified herein.

4.1.1 Main fore and aft cable runs.

4.1.1.1 Surface ships. Trunk and local cables shall be routed as follows:

a. Fiber optic trunk cables (see 3.4) shall be run in the main fore and aft cableways located port and starboard and high and low in the ship. The lower cableways shall be through the machinery spaces and corresponding platform decks, while the upper cableways shall be under the main deck. This location of cableways is designed to provide a quadrangular pattern to allow maximum athwartship and vertical separation of cables for systems requiring alternate signal paths for reliability and survivability. The athwartship separation shall be achieved by locating primary cable runs, consisting of primary channels (see 3.5) and non-redundant channels (see 3.6) and their respective alternate cable runs, consisting of alternate channels (see 3.7) and redundant channels (see 3.6), not greater than 6 feet (2 meters) from the most outboard structure (8 feet (3 meters) from curved structure) on the respective sides of the ship. The vertical separation shall be achieved by separating the primary and alternate cable runs by not less than two decks. Where two deck separation is not possible due to ship geometry, a minimum of one deck separation shall be provided. The longitudinal separation distance between vertical or athwartship primary and alternate cable runs shall be not less than 65 feet (20 meters) in the hull and 40 feet (12 meters) in the superstructure.

b. Fiber optic local cables (see 3.8) shall be routed from the end user equipment (see 3.9) to the interconnection box that services that equipment. Systems that have redundant local cables shall have these local cables routed to separate interconnection boxes. These interconnection boxes shall be separated in the athwartship direction to the maximum extent possible and vertically by not less than two decks or by a horizontal distance of 65 feet (20 meters) in the hull or 40 feet (12 meters) in the superstructure. The local cables shall be survivably separated as described in 4.1.1.a except when they are within 60 feet (18 meters) of the equipment.

4.1.1.2 Submarines. Fiber optic cables shall be run near the inner surface of the pressure hull in a quadrangular pattern to allow maximum athwartship and vertical separation of cables for systems requiring alternate signal paths for reliability and survivability.

4.1.2 Vertical cable runs. Vertical cable runs shall be organized on the basis of the fore and aft or athwartship separation of main cable runs and equipment served.

4.1.3 Control from more than one location. Where equipment is controlled from more than one location, the cables from each location shall be routed in separate cableways.

4.1.4 Control by two cables from one location. Where equipment is controlled by two cables from one location and each cable performs the same function, the two cables shall be routed in separate cableways. The cables containing the primary channel fibers and those containing their respective alternate channel fibers shall come together only at the system equipment they service. The cables containing the NRC channel fibers and those containing the cable topology supplied redundant channel fibers shall come together only at the interconnection box they service.

4.1.5 Exposure to weather. Cables exposed to the weather shall be kept to a minimum. Cable runs in the weather shall be kept to the minimum practical length to provide service to the equipment. Where possible, cables to equipment on masts, staffs, and yardarms shall be installed within the masts, staffs, and yardarms.

4.1.6 Protection of cable.

4.1.6.1 Battle damage. Protection afforded by ship structure shall be used to the greatest extent practical. Cables shall not be run on the exterior of deckhouses 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 or because of structural interference or avoidance of hazardous conditions or locations.

4.1.6.2 Mechanical damage. Cables subject to mechanical damage because of their proximity to areas frequented by personnel or by potential impact by loose equipment during shock 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 and lowered, cables shall be protected by steel casings. Channel rubber shall be used with banding straps in cableways to protect the outer jacket of cables from being cut as follows:

a. For each banding strap of a vertical cableway.

b. For each banding strap at a cableway bend, including breakout bends.

c. For cables in direct contact with the banding strap. Fiber optic cables, however, should be run in the middle of the cableway for increased mechanical protection.

d. For each banding strap where fiber optic cables are double banked with electric cables.

Where fiber optic cables are run outside of the main cableways, they shall be supported by preformed brackets or hose clamp cable retention devices featuring integral rubber inserts. The supports shall be spaced along the cable such to minimize stress and strain on the cable.

4.1.6.2.1 Cargo spaces. Cables shall be routed outside cargo spaces wherever practical. Where routing through cargo spaces is unavoidable, cables shall be protected from mechanical damage, including damage due to shifting of cargo.

4.1.6.2.2 Riser boxes and multiple cable penetrators. Riser boxes with stuffing tubes shall be installed for topside or explosionproof deck penetrations of three or more cables. Riser boxes with multiple cable penetrators (MCP's) or deck mounted MCP's with shields for mechanical protection shall be installed for passing three or more cables through a watertight deck not open to the weather. Three or more cables passing through nonwatertight decks shall be protected by a riser tube or welded collar. Where fewer than three cables pass through a deck, kickpipes or swage tubes shall be installed in accordance with Part 3 of this standard.

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

4.1.6.3 Excessive heat. Cable runs in locations subject to excessive heat or risk of fire shall be avoided. Where required, heat insulating barriers shall be installed. Cable shall not be installed adjacent to machinery, piping, or other surfaces having an exposed surface temperature greater than 149 degrees Fahrenheit (°F) [65 degrees Celsius (°C)]. Cables shall not be run over boilers, in the upper portions of firerooms, in passageways at the aft end of aircraft catapults, or in locations where they will be exposed to hot stack gases.

4.1.6.4 Excessive moisture. Cables shall not be routed through locations where they may be subjected to excessive moisture. Where cable routing near firemain, water, steam, oil or other piping is unavoidable, dripproof shields shall be provided for protection. Where cables must be run in spaces subject to flooding, they shall be installed as high as practical within the space.

4.1.7 Cable runs through bilges, submerged spaces and voids. Cables run through bilges and those 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 practical to avoid cable runs in such spaces, cables shall be installed only in those spaces which are not provided with a means for flooding. Cables shall be supported clear of decks and bulkheads to avoid condensate which might form on such surfaces.

4.1.8 Cable runs in hazardous locations. Cables may be run in hazardous locations such as magazines, battery shops and flammable liquid storage areas.

4.1.9 Cable runs in hangar spaces (aircraft carriers). Horizontal cable runs shall not pass through hangar spaces. Vertical cable runs, such as those from the second deck to the gallery or flight deck levels shall be grouped to the greatest extent practical, to reduce the number of protective casings required, and shall be protected from fire in accordance with the methods in 5.1.4.

4.1.10 Gun mounts and directors. Cables to gun mounts and directors shall be run from the deck below through the center column and located such to avoid the possibility of chafing. Watertight integrity, where required, shall be maintained. 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.

4.1.11 Rotating missile launchers. Cable runs to rotating missile launchers shall comply with drawings furnished by NAVSEA.

4.2 Installation of fiber optic cables in cableways. Fiber optic cables shall be installed by feeding the cable into position and by reeling it onto the deck in a segment by segment fashion for the entire route and then securing it into the cableways. Fiber optic cables shall not be run through the cross-tier mounting holes of cable hanger vertical support channels. Block and tackle, chain falls, or other mechanical devices shall not be used to pull fiber optic cable. The cable shall be pulled so as to avoid kinking, twisting, sharp bending (see 4.2.2), or stretching by applying excessive pulling force. Where fiber optic cables are to be mixed with electric cables in the same cableway, the fiber optic cables shall be installed last and be run on top of the electric cables where possible, and shall be located in the center of the cableway. Cableways containing armored cable should be avoided where possible. Where installation of fiber optic cables into cableways containing armored cable cannot be avoided, additional personnel shall be used during pulling due to the increased possibility for mechanical damage to the fiber optic cable. The fiber optic cable should be monitored at all bend points and at multiple points on long straight runs to ensure that the cable does not encounter sharp objects. It is recommended that only one person be used to pull the cable through the cableway and that the cable be pulled slowly, so that if it does get caught, it will be readily noticeable and cable pulling can be stopped before any damage occurs.

4.2.1 Cable slack. Cables shall be installed so that:

a. 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 or MCP's, 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 equipment shall enter cableways in a curve of sufficient radius to prevent transmission of stresses to the equipment during severe cableway deflection.

f. Cables entering or connected to equipment shall have additional slack as specified in Part 2 of this standard.

g. Cables crossing expansion joints shall have slack allowance at such points not less than equal to the maximum movement of the expansion joints.

4.2.2 Cable bend radius. During handling and installation in cableways, cable bends shall not violate the minimum dynamic bend radius (see 3.10) of four times the cable outside diameter. The completed installation shall not violate the minimum static bend radius of eight times the cable outside diameter. Special handling procedures are required during installation of cables at or below temperatures of 36°F (2°C) as follows:

CAUTION: Prolonged exposure of the cable jacket to a temperature above 320°F (160°C) could cause damage to the cable jacket.

If cable must be installed when its temperature is 36°F (2°C) or lower, that portion of the cable that must be bent during installation shall be warmed thoroughly using a heat gun (or equivalent) before installing the cable in the cableway.

4.2.3 Bulkhead and overheads. Installation of cables on the overhead and on bulkheads shall be in accordance with the methods described herein. Cables for vital systems such as interior communications and weapons control systems shall not be secured to the overhead, or to shell planking, or plating, or to ballistic bulkheads unless otherwise approved (see 3.11).

4.2.3.1 Cable hangers and supports. Cable hangers and supports shall be in accordance with DOD-STD-2003-4 and as specified herein. Only steel hangers and supports shall be used where the deck or bulkhead is steel. Aluminum or steel hangers and supports shall be used where the deck or bulkhead is aluminum; however, if aluminum hangers and supports are used, a steel hanger and support shall be installed not less than every 6 feet (1.8 meters). In those locations where the ship structure is aluminum, details of the methods for attaching steel cable hangers to the structure shall be in accordance with NAVSEA Drawing 803-5184182.

4.2.4 Ballistic structures. Attachment of cables and supports to ballistic structures shall be in accordance with the methods described herein 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 and 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.

c. Cables shall not be routed on the outboard or forward bulkheads in the forward half of the ship, nor on the outboard or after bulkheads in the after half of the ship, when the plating is 50 pounds per square foot (lb/ft^2) (244 kilograms per square meter (kg/m^2) or heavier.)

4.2.5 Double banking of cable. For surface ships, only one row of cables shall be installed on a cable hanger tier. Where space is limited, and if authorized approval is obtained (see 3.11), double banking (two rows maximum) of cables on tiers will be permitted. The requirements of 4.1.6.2 and the restraints of 4.2 shall be observed when double banking fiber optic cables with armored and unarmored electric cables.

4.2.6 Cable retention. Devices for cable retention 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. Cable retention is required at every hanger on vertical cable runs. Cable straps shall be omitted on horizontal cable runs except as follows:

a. Where the hanger has no side brackets.

b. At those locations where the cable runs change direction or pass through beams or bulkheads.

c. Where four consecutive hangers would not require straps. In this case, a minimum of one strap shall be installed on every fourth hanger.

4.2.7 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 easily traced (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 and marking shall be as specified in Part 1 of this standard.

4.2.8 Dead-ended cable. Cable installed through error or rendered useless as a result of modifications shall be removed where practical. Vacated and unused penetrations shall be sealed by methods that satisfy the tightness requirements of the structure penetrated.

4.2.9 Fiber optic topology test. The fiber optic topology shall be tested for proper optical power levels and operation during various stages of installation in accordance with Part 6 of this standard.

4.3 Cableways. Cableways shall be in accordance with DOD-STD-2003-4 and as specified herein.

4.3.1 Spare cable allowance. In the organization of principal cableways, spare cable space of approximately 20 percent of that to be occupied by the final combined electric and fiber optic cable installation (as known at the time of delivery of the ship) shall be reserved on tier bars of cable hangers and in electric and fiber optic 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 that double banking will be allowed for future fiber optic cable (see 4.2.5). During the planning phase, the Contractor shall provide cableway space in excess of the required 20 percent, in order to accommodate electric and fiber optic cables added as a result of design development occurring during the construction period.

4.4 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. Care should be taken when handling cable with exposed fibers to prevent injury to the eyes or penetration of the fibers into the skin.

c. Wash hands after handling bare fibers.

5. DETAILED REQUIREMENTS

5.1 Cableways. Cableways for fiber optic cables shall be the same as those for electrical cables given in DOD-STD-2003-4 and as specified herein. These methods will not be repeated in this standard; however, they are identified and listed here to aid the user in rapidly locating the applicable method in DOD-STD-2003-4 to be used for fiber optic cable runs.

5.1.1 Cableways (submarines). The following methods and drawings shall be used to install cableways on submarines only:

DOD-STD-2003-4, Figures 4A1 through 4A14 and
NAVSEA Drawings 302-2146949 and 302-4456087

5.1.2 Cableways (surface ships). The following methods shall be used to install cableways on surface ships only:

DOD-STD-2003-4, Figures 4B1 through 4B55

5.1.3 Cableways (general). The following methods shall be used to install cableways on both submarines and surface ships:

DOD-STD-2003-4, Figures 4C1 through 4C27

5.1.4 Cable protection. The following methods shall be used to protect cables from mechanical or environmental damage:

DOD-STD-2003-4, Figures 4D1 through 4D10

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 cableway requirements and cable protection methods 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 Subject term (key word) listing.

Cable runs
Protection of cables
Cableways
Cable tags
Fiber optic topology
Installation of fiber optic cable in cableways

Preparing activity:
NAVY - SH
(Project GDRQ-N131)

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.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

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

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER	2. DOCUMENT DATE (YYMMDD)
	MIL-STD-2042-4(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) (1) Commercial (2) AUTOVON (If applicable)	7. DATE SUBMITTED (YYMMDD)

8. PREPARING ACTIVITY

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c. ADDRESS (Include Zip Code) Commander, SEA 03Q42 Naval Sea Systems Command 2531 Jefferson Davis Hwy Arlington, VA 22242-5160	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340