NAVSEA
STANDARD ITEM

FY-19

ITEM NO: 009-123
DATE: ***01 OCT 2017***
CATEGORY: II

1. SCOPE:

1.1 Title: Fiber Optic Component; remove, relocate, repair, and install

2. REFERENCES:

2.1 Standard Items

2.2 MIL-STD-1678, Fiber Optic Cabling Systems Requirements and Measurements

2.3 MIL-STD-2042, Fiber Optic Cable Topology Installation Standard Methods for ***Surface Ships and Submarines***

2.***4*** MIL-STD-2003, Electric Plant Installation Standards for Surface Ships and Submarines

2.***5*** IA PUB-5239/31, Information Assurance Shipboard Red/Black Installation Publication

2.***6*** NSTISSAM TEMPEST/2-95, Red/Black Installation Guidance (FOUO)

2.***7*** SE000-01-IMB-010, Navy Installation and Maintenance Book (NIMB), Section IX, Installation Standards (Source CD: N00024000033)

2.***8*** S9086-PF-STM-010/CH-408; Fiber Optic Cable Topology

2.***9*** S9AA0-AB-GOS-010, General Specifications for Overhaul of Surface Ships (GSO)

3. REQUIREMENTS:

3.1 Ensure employees accomplishing work (e.g., installer, QA oversight, direct supervision) on fiber optic systems have accomplished Navy Shipboard fiber optic training and achieved certification in accordance with requirement 1306 of Part 1 of 2.2.

3.1.1 Maintain current certification for each employee working on fiber optic systems. Employees shall present certification card when requested by the SUPERVISOR.

3.1.2 Submit one legible copy, in hard copy or approved transferrable media, of a report listing all personnel involved in accomplishing fiber optic installation or repair (e.g., installers, QA oversight, direct supervision) to the SUPERVISOR prior to the start of production work.

3.1.2.1 Notify the SUPERVISOR of revisions to the list as they occur.

3.2 Submit one legible copy, in hard copy or approved transferrable media, of a report listing the written procedure for production work involving fiber optic connectors of fiber optic systems, cable plants and components, conforming to the requirements of 2.3 to the SUPERVISOR for review and approval, prior to the start of production work.

3.2.1 This procedure only requires a one-time submittal/approval unless the Standard Items or references change or are updated, and shall contain the following minimum information:

3.2.1.1 Reference of the appropriate fabrication document for which the procedure is applicable.

3.2.1.2 Qualification requirements for the personnel accomplishing the work.

3.2.1.3 Acceptance and rejection criteria.

3.3 Accomplish Navy Shipboard fiber optic installations in accordance with 2.3.

3.3.1 Accomplish a visual inspection of each fiber optic cable (conventional and Blown Optical Fiber (BOF)) in accordance with Method 6A1 of 2.3.

3.3.2 Install each new Fiber Optic Interconnection Box (FOICB), Tube Routing Box (TRB), patch panel, fusion splice tray holder, and cable in accordance with 2.3. |

3.3.2.1 Preserve the cable data package provided with new fiber optic cable. Retain the original cable data package with the unused portion of the cable.

3.3.2.2 Submit one legible copy, in hard copy or approved transferrable media, of a report containing a copy of each cable data package obtained in 3.3.2.1 and cable number listing of the cable measured from each reel to the SUPERVISOR ***upon request***.

3.3.3 Install each fiber optic cable and box to be protected from the weather in accordance with 2.3.

3.3.4 Install saddles on BOF cabling to prevent crushing the BOF tubes when tightening cableway bands in accordance with 2.3.

3.3.5 Use existing ship cableway and penetrations wherever possible. Penetrations shall be correct size in accordance with 2.3 and 2.***4***.

3.3.5.1 Accomplishment of a cableway inspection for each modified cableway and penetration shall be in accordance with NAVSEA Standard Items (See Note 4.7).

3.3.6 Install each new cable, cableway, and penetration in accordance with 2.3 to support work required by the individual Work Items.

3.3.7 Install each fiber optic cable and components which are part of a secure information processing system or are located within a secure processing space in accordance with 2.***5*** and 2.***6***.

3.3.8 Install each new fiber optic connector of the correct size and type conforming to MIL-DTL-83522, MIL-PRF-28876, or MIL-PRF-64266 in accordance with Part 5 of 2.3.

3.3.8.1 Ensure each fiber optic connector is not exposed to the industrial environment or weather.

3.3.8.2 Accomplish inspection and cleaning of both fiber optic connectors prior to mating in accordance with Method 6M1 of 2.***3***.

3.3.9 Accomplish the optical ***link loss*** test of Method 6C1 ***or Method 6C2*** in accordance with 2.3 upon the completion of connector attachment, slack management, banding, and penetration closeout for each fiber optic cable.

3.3.10 Accomplish the optical ***continuity*** test of Method 6D1 in accordance with 2.3 for cables with fibers that are not terminated on each end.

3.3.11 Accomplish the optical ***return loss*** test of Method 6K1 for single mode fiber links only in accordance with 2.3 upon the completion of connector attachment, slack management, banding, and penetration closeout for fiber optic cables.

3.3.12 Accomplish the tube seal verification test of Method 6J1 in accordance with 2.3 for BOF cables after installation of connectors.

3.3.13 Accomplish the ball bearing test of Method 6H1 in accordance with 2.3 for unused BOF tubes within BOF cables.

3.3.14 Accomplish the BOF tube end sealing Method 2J1 in accordance with 2.3 for all empty BOF tubes in tube routing boxes, fiber optic interconnection boxes, and equipment.

3.3.15 Accomplish the tube seal verification test of Method 6J1 in accordance with 2.3 for unused BOF tubes within BOF cables.

3.3.15.1 Submit one legible copy, in hard copy or approved transferrable media, of completed Attachment A for optical measurements and Attachment B for BOF cable tests listing the results of 3.3.9 through 3.3.15 to the SUPERVISOR.

3.3.16 Install new cable identification tags in accordance with Part 4 of 2.3, using 2.**7** for guidance. Mark each cable, tube, furcation unit, Optical Fiber Cable Component (OFCC) and connector in accordance with the referenced drawings, equipment technical manual and 2.3.

3.3.17 Accomplish post-installation visual inspection Method 6A1 and ***attenuation*** test Method 6E1 ***or Method 6E2*** in accordance with 2.3. For single mode links, accomplish ***return loss*** test Method 6L1 in accordance with 2.3. Post-installation visual inspection Method 6A1 shall be accomplished to verify no mechanical damage exists to the installed fiber optic cables. Post-installation optical test Methods 6E1 ***or Method 6E2*** and 6L1 shall be used to measure the optical loss and return loss (respectively) over a series of concatenated optical links and is performed after interconnection of the Fiber Optic Cable Topology (FOCT) local and trunk cables.

3.3.17.1 Submit one legible copy, in hard copy or approved transferrable media, of completed Attachment C listing results of the requirements of 3.3.17 to the SUPERVISOR.

3.3.18 Accomplish inspection and cleaning of each new and existing fiber optic connector immediately prior to mating in accordance with Method 6M1 of 2.***3***.

3.3.19 Install connectorized cables to equipment, using system drawings or other technical documents. Light Duty connectors shall only be installed within fiber optic interconnection boxes (FOICBs) or within equipment enclosures/racks. Heavy Duty connectors shall be installed externally to equipment enclosures/racks.

3.4 Accomplish Navy shipboard fiber optic repair, relocation, and removal in accordance with 2.3 and 2.***8***.

3.4.1 Install each Fiber Optic Interconnection Box (FOICB), Tube Routing Box (TRB), patch panel, fusion splice tray holder, and fusion splice tray to be repaired and/or relocated in accordance with 2.3.

3.4.2 Use existing cableways and penetrations wherever possible. Penetrations shall be the correct size in accordance with 2.3 and 2.***4***. Penetrations not reused shall be blanked in accordance with 2.3 and 2.***4***.

3.4.2.1 Accomplishment of a cableway inspection for each modified cableway and penetration shall be in accordance with NAVSEA Standard Items (See Note 4.7).

3.4.3 Accomplish the visual inspection of Method 6A1 for each fiber optic cable (conventional and Blown Optical Fiber (BOF)) in accordance with 2.3.

3.4.4 Accomplish the ***continuity*** test of Method 6D1 in accordance with 2.3 for each conventional fiber optic cable prior to repair.

3.4.5 Accomplish inspection and cleaning of each new and existing fiber optic connector immediately prior to mating in accordance with Method 6M1 of 2.***3***.

3.4.6 Isolate and repair fiber optic cable jacket in accordance with Method 1B1 of 2.3.

3.4.7 Isolate and repair each fiber optic connector in accordance with Part 5 of 2.3 to support work required by the individual Work Items.

3.4.8 Accomplish inspection and cleaning of each new and existing fiber optic connector immediately prior to mating in accordance with Method 6M1 of 2.***5***.

3.4.8.1 Ensure fiber optic connectors are not exposed to the industrial environment or weather.

3.4.9 Ensure fiber optic cables and boxes are not exposed to the industrial environment or weather in accordance with 2.3.

3.4.10 Identify and isolate each cable to be pulled back, rerouted, reused or repurposed.

3.4.11 Install new cable identification tags in accordance with Part 4 of 2.3, using 2.**7** for guidance.

3.4.12 Install new banding for cableways affected by cable removals in accordance with Part 4 of 2.3.

3.4.13 Install saddles on BOF cabling to prevent crushing the BOF tubes when tightening cableway bands in accordance with 2.3.

3.4.14 Accomplish the visual inspection of Method 6A1 for each fiber optic cable (conventional and BOF) in accordance with 2.3 upon the completion of the repair and final banding.

3.4.15 Accomplish the ***link loss*** test of Method 6C1 ***or Method 6C2*** for each fiber optic cable (conventional and BOF) in accordance with 2.3 upon the completion of the repair and final banding.

3.4.16 Accomplish the ***return loss*** test of Method 6K1 for single mode links only for each fiber optic cable (conventional and BOF) in accordance with 2.3 upon the completion of the repair and final banding.

3.4.17 Accomplish the visual inspection of Method 6A1 and the ***continuity*** test of Method 6D1 of 2.3 for repaired cables with fibers that are not terminated on each end.

3.4.18 Accomplish the tube seal verification test of Method 6J1 of 2.3 after installation of connectors and for unused BOF tubes within BOF cables. Accomplish the ball bearing test of Method 6H1 of 2.3 for unused BOF tubes within BOF cables.

3.4.19 Submit one legible copy, in hard copy or approved transferrable media, of completed Attachments A and C for optical measurements and Attachment B for BOF cable tests listing results of the requirements of 3.4.14 through 3.4.18 to the SUPERVISOR.

3.4.20 Accomplish inspection and cleaning of each new and existing fiber optic connector immediately prior to mating in accordance with Method 6M1 of 2.***3***.

3.4.21 Connect each cable, using referenced drawing or retained hook-up data.

3.4.22 Identify and isolate each fiber optic cable designated for removal.

3.4.23 Remove each fiber optic cable designated for removal in its entirety.

3.4.23.1 Blank each bulkhead penetration, deck penetration, and multi-cable transit device from which cable was removed and which will not be reused, in accordance with 2.3 and 2.***4***.

3.4.23.2 Blank each ***unused*** hole in ***equipment, in accordance with 2.3 and 2.6.***

3.4.23.3 Remove unused hangers from which cable was removed and which will not be reused, in accordance with Section 070a of 2.***9***.

3.4.24 Remove and relocate each fiber optic cable and component which are part of secure information processing systems or are located within a secure processing space in accordance with 2.***5*** and 2.***6***.

3.5 Accomplish fiber optic splicing in accordance with the BOF Cable Splice Method 1C1 of 2.3 or the fusion splice installation Method ***2K1, Method 2K2 or Method 2K3 of 2.3***. Install each fusion splice component (e.g., fusion splice, splice protector, fusion splice tray, fusion splice tray holder module) conforming to MIL-PRF-24623/6 and MIL-PRF-24728/8. Ensure each fusion splicer conforms to Commercial Item Description (CID) A-A-59799.

3.5.1 Accomplish the optical test of Method 6E1 ***or Method 6E2*** in accordance with 2.3 upon the completion of fusion splicing, slack management, banding, and penetration closeout of each fiber optic cable.

3.5.2 Accomplish the ***return loss*** test of Method 6L1 for single mode fiber links only in accordance with 2.3 upon the completion of fusion splicing, slack management, banding, and penetration closeout of each fiber optic cable.

3.5.3 Accomplish inspection and cleaning of each new and existing fiber optic connector immediately prior to mating in accordance with Method 6M1 of 2.***3***.

3.5.4 Verify continuity of each spliced tube with a ball bearing by accomplishing Method 6H1 of 2.3.

3.5.5 Accomplish the ball bearing test of Method 6H1 and the tube seal verification test of Method 6J1 of 2.3 for unused BOF tubes within BOF cables.

3.5.6 Submit one legible copy, in hard copy or approved transferrable media, of completed Attachments A and C for optical measurements and Attachment B for BOF cable tests listing results of the requirements of 3.5.1 through 3.5.5 to the SUPERVISOR.

3.6 Accomplish Navy shipboard fiber optic testing in accordance with Part 6 of 2.3.

3.6.1 Submit one legible copy, in hard copy or approved transferrable media, of completed Attachment A listing the results of the requirements of 3.6 to the SUPERVISOR.

3.7 Install new banding for cableways affected by cable installs, removals, pulled back, reused, rerouted, and repurposed in accordance with Part 4 of 2.3. Saddles shall be used on BOF cabling to prevent crushing the BOF tubes when tightening cableway bands in accordance with 2.3.

3.8 Accomplishment of local air hose tests after the installation, removal and relocation of fiber optic cables of each new and disturbed multi-cable transit device, multi-cable penetrators, stuffing tubes, kick pipes, and cable penetrations of tightness boundaries shall be in accordance with NAVSEA Standard items (See Note 4.8).

3.9 Accomplishment of cleaning and painting for new and disturbed surfaces shall be in accordance with NAVSEA Standard Items (See Note 4.9).

3.10 Inspect Navy shipboard fiber optic installations, repairs, relocations, and removals in accordance with 2.3.

4. NOTES:

4.1 The requirements in this Standard Item apply to installation, repair, removal, relocation, test, and inspection of fiber optic components on Naval surface ships and submarines and personnel supporting these tasks. This Standard Item applies to the following fiber optic cable usages; new, pulled back, reused, rerouted and repurposed.

4.2 Definitions.

4.2.1 New Cable – a new fiber cable is defined as a cable not previously installed.

4.2.2 Pulled Back Cable – a pulled back fiber cable is defined as those which are disconnected and physically removed from a wireway, conduit, or cableway to protect the cable from industrial use.

4.2.3 Reused Cable – a reused fiber cable is defined as those cables disconnected from the equipment to facilitate equipment removal.

4.2.4 Rerouted Cable – a rerouted fiber cable is defined as those cables disconnected from their equipment and physically moved to a new wireway, conduit or, cableway and then reconnected in the new location to the same equipment.

4.2.5 Repurposed Cable – a repurposed fiber cable is defined as those which have had their fiber or non-fiber termination points changed. This could be the result of changing terminal board connections, connector reconfiguration, using spare conductors or fibers, or any change to the way the cable conductors or fibers are used.

4.3 Cable installations consist of cable, banding, boxes, equipment, penetrations, cableways, cable separation and connection(s) and associated components.

4.4 The formats of Attachment A, B and C are provided as guidance. Other reporting formats can be used with the approval of the SUPERVISOR.

4.5 Navy fiber optic Technical Authority policy letters and drawings, and the list of Certified Navy Shipboard Fiber Optic Trainers (CFOTL) can be located by sending an email to DLGR_NSWC_FOWEB@navy.mil with the specific subject line of: website URL request

4.6 The Navy Shipboard Fiber Optic Technical Authority is: DLGR_NSWC_FO_ENG@navy.mil

4.7 If cableway inspection of 3.3.5.1 or 3.4.2.1 is required, the use of Standard Item 009-73 "Shipboard Electrical/Electronic Cable; remove, relocate, repair, and install" of 2.1 will be specified in the Work Item.

4.8 If local air hose test of 3.8 is required, the use of Standard Item 009-25 "Structural Boundary Test; accomplish" of 2.1 will be specified in the Work item.

4.9 If cleaning and painting for new and disturbed surfaces of 3.9 are required, the use of Standard Item 009-32 "Cleaning and Painting Requirements; accomplish" will be specified in the Work Item.

ATTACHMENT A

OPTICAL MEASUREMENT RECORD (FOR ASSEMBLY LINK LOSS/RETURN LOSS)

DATE_____/_____/_____ HULL NUMBER_____
ENDPOINT LOCATIONS OR EQUIPMENT NAME: SOURCE_____ DETECTOR_____
INSTALLATION/CONFIGURATION DRAWING_____ CABLE SERIAL NUMBER_____ CABLE TYPE[1]_____
CABLE VISUAL INSPECTION RESULT (INSTALLATION) _____
CONNECTOR TYPE(S)[1]_____ TEST EQUIPMENT MANUFACTURER/MODEL NO. _____ SERIAL NO._____ CALIBRATION DUE
DATE_____/_____/_____ SOURCE WAVELENGTH(S)(NM)_____ /_____ CONNECTOR ENDFACE QUALITY(IAW Part 5 of 2.3)_____

SOURCE CABLE NO[2]	DETECTOR CABLE NO[2]	850NM/1300NM/1310NM/1550NM WINDOW (CIRCLE ONE)									
FIBER COLORS[3] OR NUMBER	FIBER COLORS[3] OR NUMBER	ACCEPTABLE ASSEMBLY LINK LOSS (dB) (6C1/***6C2***)	ACCEPTABLE RETURN LOSS (dB) (6K1)	FORWARD REFERENCE POWER (6C1/***6C2***)	FORWARD MEASURED POWER (6C1/***6C2***)	FORWARD ASSEMBLY LINK LOSS RESULT[4] (dB) (6C1/***6C2***)	FORWARD RETURN LOSS RESULT[5] (dB) (6K1)	REVERSE REFERENCE POWER (6C1/***6C2***)	REVERSE MEASURED POWER (6C1/***6C2***)	REVERSE ASSEMBLY LINK LOSS RESULT (dB)[6] (6C1/***6C2***)	CABLE LENGTH (M) (6C1/***6C2***)

NOTES: [1]RECORD MIL-SPEC NUMBER IF APPLICABLE.
[2]FOR LINK MEASUREMENTS ONLY.
[3]STANDARD COLORS: BLUE, ORANGE, GREEN, BROWN, SLATE, WHITE, RED, BLACK, YELLOW, VIOLET, PINK, AQUA.
[4]FOR SINGLEMODE AND MULTIMODE FIBER LINKS IAWMETHOD 6C1 ***OR 6C2*** OF REFERENCE 2.3.
[5]FOR SINGLEMODE FIBER LINKS ONLY IAW METHOD 6K1 OF REFERENCE 2.3.
[6]FOR MULTIMODE FIBER LINKS IAW METHOD 6C1 ***OR 6C2*** OF REFERENCE 2.3.

REMARKS:_____

SIGNATURE:_____

ATTACHMENT B

BLOWN OPTICAL FIBER (BOF) TEST RECORD

DATE_____/_____/_____ HULL NUMBER_____
INSTALLATION/CONFIGURATION DRAWING_____ CABLE SERIAL NUMBER_____ CABLE TYPE[1]_____
CABLE VISUAL INSPECTION RESULT (INSTALLATION/POST-INSTALLATION) _____/_____

LOCATION 1	LOCATION 2	EQUIPMENT 2 IDENTIFICATION	BOF TRUNK CABLE IDENTIFICATION	BOF TRUNK TUBE NUMBER	BALL BEARING (BB) TEST DIRECTION[2] (6H1)	BOF TUBE BB TEST RESULT[3] (PASS/FAIL) (6H1)	BB SIZE PASS/FAIL[4] (6H1)	BOF TUBE LODGED WITH BB (Y/N) (6H1)	BOF TUBE SEAL VERIFICATION RESULTS[5] (PASS/FAIL) (6J1)	CABLE LENGTH (M)

NOTES: [1]RECORD MIL-SPEC NUMBER IF APPLICABLE.
[2]FOR EXAMPLE, TEST DIRECTION = "LOCATION 1 → LOCATION 2" OR VICE VERSA.
[3]IAW METHOD 6H1 OF OF REFERENCE 2.3.
[4]FOR EXAMPE, BB SIZE = "4.5 MILLIMETER(MM)".
[5]IAW METHOD 6J1 OF REFERENCE 2.3.

REMARKS:_____

SIGNATURE:_____

ATTACHMENT C

OPTICAL MEASUREMENT RECORD (FOR FOCT END-TO-END ATTENUATION AND RETURN LOSS)

DATE_____/_____/_____ HULL NUMBER_____
ENDPOINT LOCATIONS OR EQUIPMENT NAME: SOURCE_____ DETECTOR_____
INSTALLATION/CONFIGURATION DRAWING_____ CABLE SERIAL NUMBER_____ CABLE TYPE[1]_____
CABLE VISUAL INSPECTION RESULT (POST-INSTALLATION) _____
CONNECTOR TYPE(S)[1]_____ TEST EQUIPMENT MANUFACTURER/MODEL NO. _____ SERIAL NO._____ CALIBRATION DUE DATE_____/_____/_____
SOURCE WAVELENGTH(S)(NM)_____ /_____ CONNECTOR ENDFACE QUALITY (IAW Part 5 of 2.3)_____

SOURCE CABLE NO.	DETECTOR CABLE NO.	850NM/1300NM/1310NM/1550NM WINDOW (CIRCLE ONE)							
FIBER COLORS[2] OR NUMBER	FIBER COLORS[2] OR NUMBER	ACCEPTABLE FOCT END-TO-END ATTENUATION (dB) (6E1/6E2)	ACCEPTABLE FOCT END-TO-END RETURN LOSS(dB) (6E1/6E2)	FORWARD REFERENCE POWER (6E1/6E2)	FORWARD MEASURED POWER (6E1/6E2)	FORWARD FOCT END-TO-END ATTENUATION RESULT (dB)[3] (6E1/6E2)	FORWARD FOCT END-TO-END RETURN LOSS RESULT (dB)[4] (6E1/6E2)	TEST DIRECTION[5] (6E1/6E2)	CABLE LENGTH (M)

NOTES: [1]RECORD MIL-SPEC NUMBER IF APPLICABLE.
[2]STANDARD COLORS: BLUE, ORANGE, GREEN, BROWN, SLATE, WHITE, RED, BLACK, YELLOW, VIOLET, PINK, AQUA.
[3]IAW 6E1 or ***6E2*** OF REFERENCE 2.3.
[4]IAW 6L1 OF REFERENCE 2.3.
[5]FOR EXAMPLE, "SOURCE LOCATION → DETECTOR LOCATION".

CONNECTION LIST:_____ REMARKS:_____

SIGNATURE:_____